

IMT Institute for Advanced Studies, Lucca
Lucca, Italy

**Human Occupation Development in the High Mountains of
Sinai Peninsula, Egypt**

*With Alpine and Himalayan Reflections in the Light of Rural-
Urban Development 'Socio-economy', Semi-Arid Watershed
Management 'Socio-ecology' and Land Use Policy 'Governance'*

**PhD Program in Management and Development
Of Cultural Heritage MDCH
XXV Cycle**

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IMT Institute for Advanced Studies, Lucca

2013

DEDICATED TO

*THE EGYPTIAN NATIONAL REFORMS
REVOLUTION*

OF

JANUARY 25, 2011 CE

&

THE ONES WHO BELIEVE IN FAIR PEACE

IN

THE MIDDLE EAST

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Abstract

In theory and practice, centralization, sub-optimization, and trans-border crisscross culture have been extensively discussed over decades with limited progress on the interdisciplinary level in the developing countries (precisely in the remote semi-arid highland regions: the High Mountains of Sinai Peninsula). Post the Egyptian National Reforms Revolution of January 25, 2011 CE, the need for a decentralized governance structure in the Arab Republic of Egypt surfaced once again as one of the very demanding reforms for socio-economic and socio-ecological sustainable development., accounting to several domestic (e.g. social strategy, behaviour and stratification; traditional tribal system 'kinship seniority' and alliances; social homogeneity subdivisions; survival strategies and interaction; urbanization, trade and mobility; productivity and resources exploitation) and external ones (e.g. cross political and economic interest, and warfare).

A Comparative Corporate Governance Model 'CCGM' based on three integrated sub-models is conducted to identify, address, and feasibly resolve the previously discussed issues:

- 1 a newly modified timeline-based version of Quality Function Deployment 'QFD', addressing the socioeconomic aspects and needs (i.e. issues of interest; domestic and global practice)
- 2 heritage-based arid/semi-arid watershed management model, utilizing the heritage economic-conservation and experimental archeology methodologies and techniques as the core for a low cost model
- 3 dynamic sub-monitoring model, enabling multilevel decision making actions (i.e. predictive/preventive); all under routine and breaking governance events

In practice, the high mountains act as a system under pre-defined criteria. The CCGM resolves the legislative and administrative constraints (e.g. land use and ownership) by decentralizing the planning and decision making process on the micro-local/municipal and macro-regional/governorate levels. It is an interdisciplinary approach towards natural-cultural heritage conservation and preservation under the sustainability and decrease theories while being subjected to a domestic profit maximization trend. It is conducted in Sinai Peninsula with reflections on the Alpine and Himalayan contexts.

Description of chapters

Background

In March 2010 - March 2013 CE, this PhD study is being conducted under extremely challenging circumstances as a result of the Egyptian National Reform Revolution of January 25, 2011 CE. The political event enforced new parameters. On one hand, it enriched the study-research with a new political transition phase—which does not necessarily lead to a socioeconomic transition on the micro-local/municipal rural-urban level. It verifies the viability of the Quality Function Deployment 'QFD' model which was conducted prior the revolution in March-December 2010 CE 'Part I'. On the other hand, the study-research is subjected to a highly dynamic socioeconomic development phase, being reflected in the context of the PhD study. The study is conducted via IMT Institute for Advanced Studies Lucca 'Management and Development of Cultural Heritage PhD Program - MDCH', Lucca, Italy in collaboration with the European Research Academy 'EURAC', Institute for Alpine Environment 'AlpEnv', Bolzano/Bozen, Italy 'SinaiAlps Project' (i.e. phase II: analysis work). It is based on an earlier survey work in the High Mountains of Sinai Peninsula by Sinai Peninsula Research 2000-2010 CE (i.e. phase I: survey work).

Part I

It discusses the historical and socioeconomic/socio-ecological sustainable development context of the High Mountains of Sinai Peninsula. It acts as a Route Cause Analysis 'RCA' (i.e. equivalent to a pre-feasibility/opportunity study).

Chapter one

It introduces the study-research via the role of the nonprofit cultural entrepreneur and/or researcher as a mediator between an integrated cluster of centralized nano-economies and multilevel governance spheres in the High Mountains of Sinai Peninsula. The chapter outlines the core obstacles and challenges under a regional context, introducing the contemporary argumentative governance-control approach over the flow of resources.

Chapter two

It reviews the historical rise of the High Mountains of Sinai Peninsula via an extensive interdisciplinary socioeconomic timeline–transition phases–with further historical and contemporary emphasis on three core cultural landscape aspects: i) treasury of the Holy Monastery of St. Catherine, the world’s oldest continuously inhabited structure since 6th century CE; ii) aesthetics of a sacred landscape; iii) daily life in theory (i.e. documentation) and practice; all relative to the socioeconomic sustainable development. The chapter describes in details the historical development of the key parameters until the Egyptian National Reform Revolution of January 25, 2011 CE.

Chapter three

It discusses a newly introduced model in order to evaluate the for-profit and nonprofit organizations (i.e. Quality Function Deployment ‘QFD’), the two pillars of the latest development regional fund of the European Commission economical transition phase ‘South Sinai Regional Development Program - SSRDP’ in 2006-2010 CE. The chapter fulfills the necessity to develop a model in order to address the interest of a local community (i.e. issues of interest); to measure the weight of importance of these issues for a target-community; to measure the relation between nonprofit/for-profit organizations with the issues of interest, while evaluating the nonprofit/for-profit organizations via a set of indicators-indexes of efficiency; all under a timeline pattern, showing the progress in the issues of interest under different administrations. It concludes by analyzing and prioritizing the socioeconomic and socio-ecological needs of the rural-urban community of the High Mountains of Sinai Peninsula relative to the deliverables of the nonprofit/for-profit organization via a business-based problem solving technique. Both the economical feasibility and impact importance are to be achieved via a set of recommendations–Set I: socio-economy based–utilizing the concept note of South Sinai Regional Development Program ‘SSRDP’ in 2006-2010 CE as a conceptual guide.

Part II

It analyses the environmental capacity of the High Mountains of Sinai Peninsula in fulfilling the socioeconomic and socio-ecological needs of

Description of chapters

the rural-urban community which are identified and addressed in part I. It acts as a continuation for the pre-feasibility/opportunity study.

Chapter four

It utilizes a set of environmental indicators in order to initially quantify the overall controversial environmental capacity conception of the mountain range in terms of land cover, anthropogenic influence, landscape diversity, landscape fragmentation and protected areas. The chapter concludes with a set of recommendations–Set II: socio-ecology based– to be executed on two sustainable development phases.

Chapter five

It ecologically emphasizes on the water issue. The status of the water issue is classified in the recommendations' Sets I and II–Part I and the environmental indicators results–as an under-studied ecological aspect in the semi-arid High Mountains of Sinai Peninsula. The chapter socio-ecologically approaches the water issue by conducting a watershed management model in practice.

Part III

It formulates the previously identified and addressed socio-economic and socio-ecological needs–constrained by the environmental capacity of the mountain range–into a governance model and land use policy. It acts as the foundation for a feasible execution phase.

Chapter six

It introduces a neo governance structure. It is a full-scale dual phase alternative; phase I (i.e. semi-decentralization '5-10 years': education and socioeconomic leverage phase), reaching its maturity in phase II (i.e. micro-local financial resources decentralization 'full democratization'). The chapter simultaneously introduces an appointments and elections system on the micro-local/municipal level along with a multilevel monitoring system.

Chapter seven

It enforces the land use argument on comparative basis as the resource and/or commodity which reflects the socio-economic and socio-ecological needs of the rural-urban community of interest on one hand, and the environmental capacity on the other hand. The chapter comparatively reviews the historical socio-ecological development of land use patterns under the Sinaitic and Alpine contexts.

Chapter eight

It focuses on the driving forces of demand for land resources, and the economic instruments for land resources management on micro-local/municipal level in the High Mountains of Sinai Peninsula. The chapter focuses on the agriculture cooperatives as a viable production system in managing-land use-and preserving the economical feasibility of land resources.

Chapter nine

It concludes the PhD study via a contextual review for the core argumentative research questions, raised and discussed throughout the study-research in the High Mountains of Sinai Peninsula. The chapter navigates through conceptual reflections on multilevel interdisciplinary aspects.

PART I

1. The third sector: nonprofit cultural entrepreneur between centralization, sub-optimization and crisscross cultures

1.1 The third sector

The role of nonprofit organizations is described by the Peace Corps as:

The third sector, which consists of nongovernmental organizations, provides services that the business and government sectors are unwilling or unable to provide, and they provide a venue for citizens to come together and be heard on issues that they feel are important (Peace Corps, 2009).

The nature of nonprofit organizations varies between being a foundation, trust, association...etc. Basically, the nonprofit organizations provide services for the community of interest (i.e. target-group), as the performance of the nonprofit organizations is measured in terms of benefit-cost. On the other hand, dollars-cost is the main concern of for-profit organizations.

Each of the active sectors in the civil society (i.e. governmental, private and nonprofit sectors) plays a vital role for the welfare of the community and among them the national-international funding organizations (i.e. EU 'European Union' Commission, UNDP 'United Nations Development Programme', UNESCO 'United Nations Educational, Scientific and Cultural Organizations'...etc.). The efficiency of the three main sectors of the civil societies depends on their integrity. In other words, the overall degree of success-failure within the communities depends on the ability of the three sectors to establish efficient integrated clusters of interest for the benefit of the largest number of individuals, families and target-groups. The three sectors overlap by clustering and networking. As a result of the civil societies' crucial demand for integrity, the role of the nonprofit cultural entrepreneurs is essential in order to bridge the gaps between different sectors (Makhad, 2010).¹ Regarding nonprofit cultural entrepreneurs,

¹ On the other hand, the private entrepreneur and entrepreneurship is theoretically defined as: "One of the most widely accepted definitions of an entrepreneur—a word coined by Richard Cantillon, an Irish banker residing in

their scale of impact varies according to the local environment of interest, but all entrepreneurs still share a common target:

....creates cultural value and economic wealth, self-determination, and cultural diversity in communities across the globe....Cultural entrepreneurship is an emerging area of practice and theory. Underlying the growing interest in cultural entrepreneurship is the understanding that sustainable change can only be developed when innovations are crafted from endemic cultural knowledge and traditions (Global Center for Cultural Entrepreneurship, 2010).²

The cultural entrepreneurs occupy an intermediate role between multiple sets of interconnected, interchanging and inter-impacting economical clusters (i.e. nano, micro and macro; rural, urban and/or mixed rural-urban).

The consideration of local cultural value and traditional knowledge relative to the surrounding environment is the keyway for a balanced geo-distributed socioeconomic sustainable development. The cultural entrepreneurs target the establishment of heritage-based economies via innovation, bridging local cultural value and traditional economies with modern market economy. The reduction and elimination of possible negative impacts via feasible impact assessments, in addition to the leverage of local cultural value and traditional knowledge; all are key issues in order to achieve sustainable added-value. It is a matter of community-sector alignment, a context of natural and cultural resources. The context of human culture and traditions is based on multidisciplinary interconnected, interchanging and inter-impacting relations. The nature of cultural entrepreneurs should cover a wide

France—is a businessperson who operates and willing to take risks under conditions of uncertainty....(according to Joseph Schumpeter)....who disrupts the existing equilibrium in the capitalist system and, by so doing, generates short-term cycles of instability and a long-term process of growth....(according to Fritz Redlich)....stresses processes of adoption and adaptation....(according to Arcadius Khan)....who also recognized elements of risks and innovation....entrepreneur recognizes genuine opportunities that others fail to see....(according to Peter Temin)....entrepreneurs are “agents of change” who tackle the challenge of the unknown and “immeasurable risk.” Managers, in contrast, are “agents of stability” who deal with “measurable risk.” (Karlinsky, 2005)

² “Marginal status or location often triggers private enterprise, as the entrepreneur is eager to integrate into the mainstream and exploit economic opportunities that the mainstream ignores.” (Karlinsky, 2005)

scope of multidisciplinary issues in order to realize the complex relations and constraints which imply under different circumstances.

1.2 Integrated economical clusters

Centralization is a key issue which implies to different multidisciplinary cultural subjects (i.e. geography, history, archeology, anthropology, demography...etc.), as it also implies to different forms of economy (i.e. nano, micro and macro) and to different natures of civil societies (i.e. rural, urban and/or mixed rural-urban). It is an element which acts as an index-indicator for governance. Centralization is a strategic index-indicator to be used in order to measure the immeasurable, providing a geographical perspective for the scale of impact of different multilevel sectors regarding the deliverables to the final beneficiaries. The context of deliverables varies according to the field of interest and target-group (i.e. cultural, environmental, socioeconomic...etc.).

Actually, governance is a strategic approach of decision making which influences the role of the three main sectors of civil societies. The upper and lower control lines of civil activity are set by the central government, represented in its ministries and departments. On the other hand, the upper and lower control lines are based on the context being provided by different local-regional authorities of the state of interest (i.e. governorates, city councils...etc.). The integrity between different levels of governance and the availability of parallel feedback channels for the nonprofit and private sectors, both would guarantee a two way communication system which addresses the socioeconomic needs in the right position, while being considered by the central government.

Centralization is a top-down approach for decision making with limited involvement of the different levels of governance and other sectors, causing relative disturbance within the civil societies according to the degree of centralization. The nonprofit cultural entrepreneurs in cooperation with the local-regional authorities should utilize the parallel feedback channels in order to address the socioeconomic local-regional needs of the community of interest via the local-regional representatives of the central government. The utilization of the parallel feedback channels would limit the negative impact which might be caused by any miss-adopted policy by the central government.

The best practice of governance control for a balanced geo-distributed socioeconomic sustainable development and economic conservation-utilization of cultural-natural resources is the establishment of multiple sets of integrated clusters. The local level is based on an integrated cluster of nano-economies, creating a micro-economy. The regional level is based on an integrated cluster of micro-economies, creating a macro-economy (Fig. 1). Mainly, the cluster of nano-economies is based on household and/or small-medium size enterprise-based economies (i.e. extinct traditional supportive economical activity, traditional supportive economical activity, rising supportive-economical activity and main economical activity 'modern market economy') (Shams, 2010a, 2010b, 2011a, 2011b, 2011c, 2011d, 2001e, 2011f, 2012a, 2012b, 2012c).

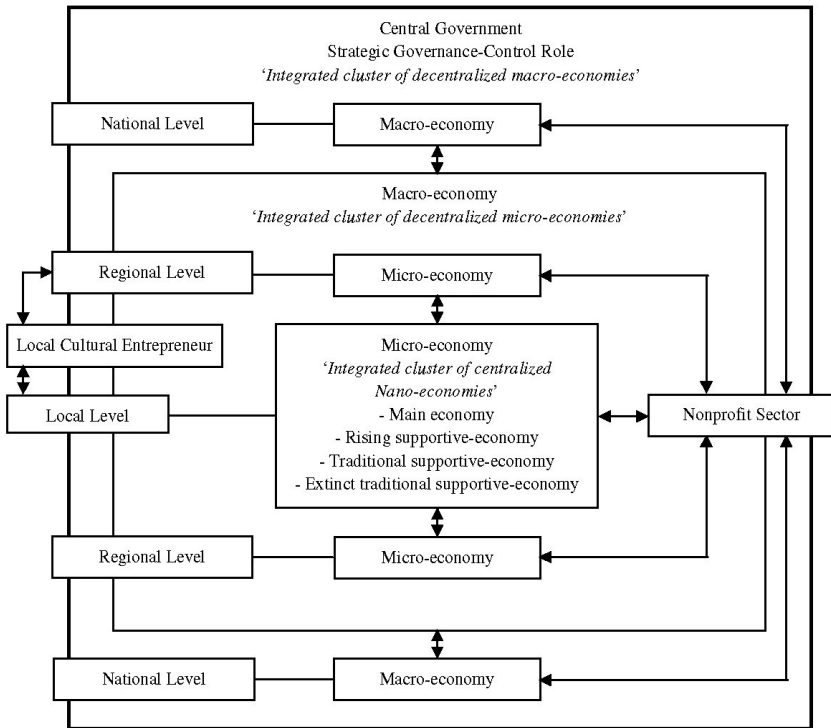


Figure 1 Integrated economical clusters (horizontal perspective) and multilevel governance-control (vertical perspective): Sinai Peninsula Research 2000-2010 CE

The Third Sector

On the first-highest level of income, the main economy is the leading-core modern market economy of any micro-economy. It is the main source of local income which generates revenues, contributing in the national Gross Domestic Income 'GDI'. Such an economy could be a heritage-based economy which emerged from the cultural values and traditional knowledge of the local community, or it could be a newly introduced local economy. The leading main economy is part of a regional economic belt, as it overlaps the local micro-economy with other micro-economies within the region of interest.

On the second level of income, the rising supportive-economical activity provides an alternative supportive economy for the local community. Similarly to the main economy, it could be a heritage-based or newly introduced economy. On the third level of income, the traditional supportive economical activity is a constant economy at low profile. As a result of economical transitions and regulations of sustainable development, some newly introduced legislation put an end to certain economical activities, converting them to extinct traditional supportive-economical activities (Moffitt et al., 2009).

Regarding the three levels of income, the terms seasonality, dependency, integrity, elemental-partial market failure and economical crisis play a vital role in describing the interconnected, interchanging and inter-impacting relations which control the three levels of income within a single micro-economy, relative to the governance control role within the civil societies and the position-role of a micro-economy relative to its macro context.

Seasonality is a matter of rise and decline bounded by a timeframe. All the three levels of income are subjected to seasonality which might occur simultaneously or separately. Under the influence of seasonality, the inter-impacting relation between the levels of income could be proportional, inversely proportional or independent; indicating the degree of dependency. The interconnected relation between the levels of income indicates the degree of integrity. The degree of integrity and dependency, both indicate the market behavior during the elemental or partial failure concerning one level of income due to external and/or internal factors. A higher degree of integrity and lower degree of dependency should be targeted by the three main sectors of civil societies, as a higher degree of dependency would lead to an economical crisis. Obviously, an economical crisis is characterized by a

direct impact on the highest level of income, represented in the main economical activity of the micro-economy. Usually, it occurs due to an external factor which impacts one of the economical-belts of a macro-economy. Accordingly, if the main economical activity of the micro-economy is part of the impacted economical-belt, the micro-economy will not escape the economical crisis. There are various causes for an economical crisis and usually influenced by a geopolitical context. Temporarily under a medium timeframe (i.e. 3-5 years), the levels of income might interchange positions during an economical crisis; or it might undergo a permanent interchange, causing an economical transition.

There is no doubt, an integrated cluster of decentralized macro-economic nature of the state of interest would support the governmental sector in the governance control process, leveraging the degree of integrity while decreasing the degree of dependency in order to create a socioeconomic sustainable development system, where the levels of income and the multiple sets of economical clusters integrate for the welfare of the local community. A multilevel governmental sector provides a feasible strategic scope via a massive input of assessments and analysis via its feedback channels. Nonprofit cultural entrepreneurs work closely with the local communities, enabling them to provide a full scale heritage-based impact assessment and risk analysis based on the cultural values and traditional knowledge of the local communities of interest. This close contact with the individuals, families and/or target-groups facilitates the identification of the socioeconomic needs, as nonprofit cultural entrepreneurs undergo a continuous local consultation process in order to stand on the instant and long-term needs of a local community.

1.3 Sub-optimization verses integrity

Actually, a higher degree of integrity verses sub-optimization. Sub-optimization as defined by William J. Stevenson is:

The result of different departments each attempting to reach a solution that is optimum for that department (Stevenson, 2005).

Sub-optimization causes poor and/or short-scope decisions, as it decreases the degree of integrity between the levels of income on one hand and the multiple sets of economical clusters on the other hand, leading to a decrease in the number of final beneficiaries. There are

three basic categories for the decision environments: certainty (i.e. relevant parameters of known values), risk (i.e. probabilistic outcomes for certain parameters) and uncertainty (i.e. the impossibility of assessing various future events). Nonprofit cultural entrepreneurs play a vital role in reinforcing the degree of certainty for the local governments. The degree of certainty is reinforced via targeting a higher degree of integrity and a lower degree of sub-optimization under a bounded rationality:

The limitation on decision making caused by costs, human abilities, times, technologies, and availability of information (Stevenson, 2005).

The integrity between the economical clusters and the levels of income, both are crucial elements in order to control the scale of sub-optimization.

1.4 Crisscross cultures, sustainability and funding

Decentralization is a geopolitical matter as much as it is an economical matter, both related to the national and international market domination. Under globalization, a higher degree of dependency is somehow favorable for the private sector in order to dominate the markets; as for politicians, governance control is a matter of democracy control to a certain extent. Although such an issue influences the civil societies, it is out of scope to discuss this matter, but local nonprofit cultural entrepreneurs should consider the dominating powers within the society for a better practice.

Crisscross cultures are a feature of globalization. In a broader context, it is a result of migration and demographic patterns, institutional-organizational and sectoral interaction...etc. The nonprofit cultural entrepreneurs usually work under crisscross cultures, where entrepreneurs are expected to conduct innovative ideas based on cultural values and traditional knowledge of the community in order to decrease the degree of conflict which could rise due to the interaction between different components of the civil societies.

According to Pearce and Turner 1990, sustainability is:

Maximizing the net benefits of economic development, subject to maintaining the services and quality of natural resources overtime (Bell et al., 2008).

The definition also implies to the cultural resources relative to economic development. Crisscross cultures might come to ruin the local cultural values and traditional knowledge, or to reinforce and sustain such an asset via an innovative approach which sets the local culture and traditions in a favorable position within the modern market economy. At some rural, semi-urban 'mixed rural-urban' and urban areas, the sectors of civil societies fully and/or partially succeeded in merging traditional heritage-based economies within modern market economy, approaching a source of income represented in rising supportive-economical activity. Sometimes the traditional heritage-based economies occupy the leading position as a main economy.

Sustainability is directly proportional with the capability of the heritage-based projects to generate revenues. International organizations such as EU Commission, UNDP, UNESCO...etc. occupy an intermediate role between research and competitive markets (i.e. mediator). Similar organizations provide initiative and supporting funds for the government, private and non-profit sectors. Similar funds are directed towards capacity-building, social development, public awareness, cultural heritage, environment, and sustainable development (i.e. infrastructure and tangible public services are positively perceived by local communities) (SSRDP, 2006a, 2006b). Regarding the private sector, similar funds are granted to the projects which are characterized by income provision to the largest number of final beneficiaries. Funds could be also generated via charitable donation(s), membership(s), partnership(s), sponsorship(s)...etc. It is crucial to address the cultural values and traditional knowledge in the right position in order to approach the available feasible national and/or international funds. A clear mission and vision besides a predetermined master-target and a very well identified output and final beneficiaries, all would guarantee a sustainable supply of revenues and funds. Such a clear perspective is a matter of transparency which would guarantee the granters an acceptable degree of efficiency (i.e. benefit-cost). A higher degree of transparency is a social capital. In other words, a higher degree of transparency smoothens the flow of funds between the multilevel sectors and economical clusters (Fig. 2).

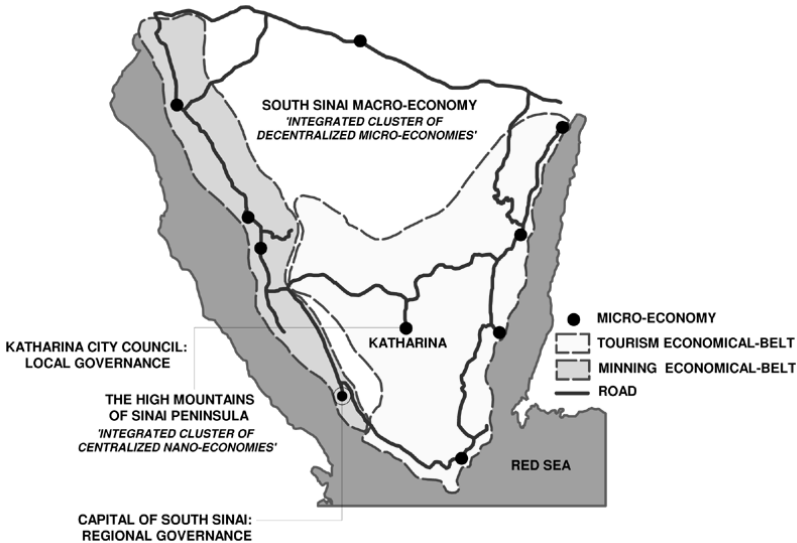


Figure 2 South Sinai macro-economical structure (Egypt) ‘integrated cluster of decentralized micro-economies’: Sinai Peninsula Research 2000-2010 CE

1.5 Summary

There is no doubt; the nonprofit cultural entrepreneurs should realize the structure and context of the work environment regarding the communities of interest in order to leverage the cultural values and traditional knowledge, linking both with modern market economy. Basically, it is a two dimensional work environment: on one hand, the horizontal dimension ‘perspective’ is represented in multiple sets of nano, micro and macro economical clusters; while on the other hand, the vertical one is represented in multilevel government, private and nonprofit sectors. The elemental parts which form such a system are the different levels of income and geo-distribution of the economical-belts. In order realize market behavior under the crisscross cultures and the dominating geopolitical and economical powers, and to avoid sub-optimization, elemental or partial market failure and/or economical crisis, several indicators-indexes and relations should be realized:

- 1 interactive relation as a degree of integrity
- 2 inter-impacting relation as a degree of dependency

3 inter-changing relation under a timeframe as an economical transition

All the relations indicate the overall degree of centralization and sub-optimization (i.e. governance control). The degree of transparency is a crucial social capital for the sustainable flow of revenues and funds. This basic set of indicators-indexes and relations stand behind the success or failure of the heritage-based socioeconomic sustainable development within the communities of interest (Fig. 3).

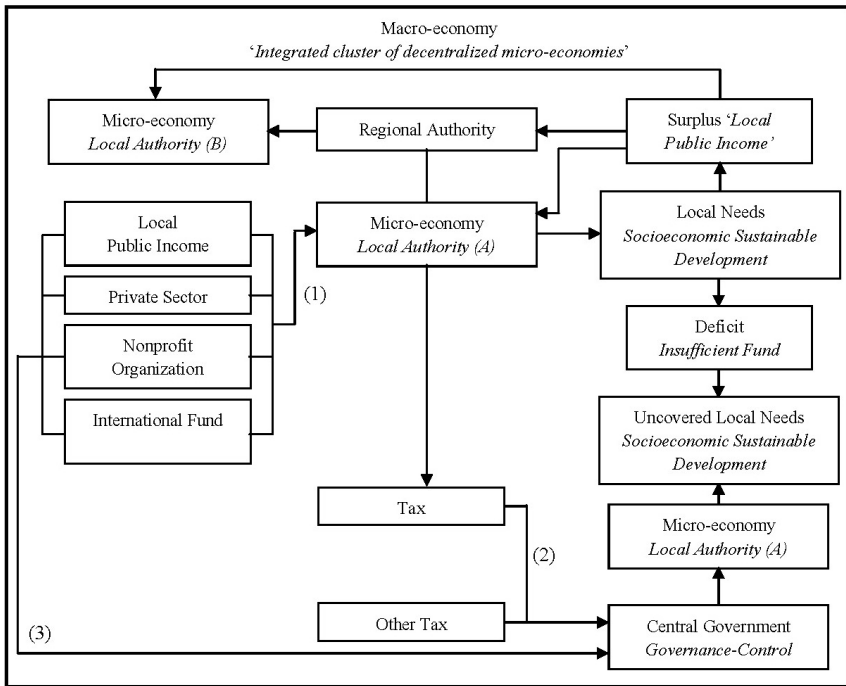


Figure 3 Argumentative governance-control approach for the flow of resources; (1) decentralized 'feasible' approach; (2) alternative source for the decentralized approach in the case of a deficit; (3) centralized approach: Sinai Peninsula Research 2000-2010 CE

2. Sacred landscape

2.1 The rise of a sacred landscape

Sacredness is a matter of human identification over a considerable period of time, or a matter of recent identification due to recent event(s) or discovery(ies). It is a historical-religious or a recent tradition being inherited by the successors and believers, as it is a result of worship and beliefs. The existence of the successors-believers is the key factor which differentiates between a living sacred landscape and the historically known ones which occupied such a role during a certain period in history (i.e. lost its sacredness and currently being identified as a historical and/or archeological site). Sacredness implies to both natural and cultural landscapes. Humans identify sacred landscapes as a result of divine event(s) which occurred at some point in history, characterizing a specific natural and/or cultural landscape as a holy landscape. The sacred landscape could be a natural landscape of origin where the divine event(s) took place, revealing the power of the worshiped, as the successors-believers inherit a traditional knowledge about its sacredness; it could be a cultural landscape where the successors-believers carved history for their beliefs via human-built structures (i.e. sacred structures); or it could be both by imposing the cultural landscape onto the natural landscape where the divine event(s) took place, carving and establishing sacred structures as a memorial and/or a place for worship. Culture could be tangibly and/or intangibly imposed on the natural landscape, creating a religious tradition of identification.

Living sacred landscapes are characterized by their historical and present pilgrims, as the travelers era occupies a transition phase between the historical pilgrim's era on one hand, and the present mass tourism and modern pilgrimage era on the other hand (i.e. 240 million pilgrims/year/worldwide) (Goral, 2010). Early pilgrims followed historic traditional routes to sacred destinations, creating historical pilgrimage routes and carving the way to sacred landscapes. Such historic pilgrimage routes were traversed and documented by the travelers who were researchers, historians, archaeologists, geographers, geologists, botanists, naturalists, artists, domestic people, occupiers...etc. Along those pilgrimage routes, other divine events

might have occurred, structures were built (i.e. guarding stations, fortresses and towers; way stations for water and food supplies; monastic settlements; artificial landmarks; pilgrims' tombs and burials...etc.), and inscriptions were carved; all marking the way to a sacred destination and creating the history and/or the sacredness of the routes. Pilgrimage routes are characterized by people who follow each other steps, being led by the metaphysical theology (Ames, 1941).

After the initial identification of a natural landscape as a sacred land, the successors-believers start to visit the land as pilgrims, as some of them were inspired enough to settle down out there, forming monastic and/or religious communities. Similar communities which live in a sacred wilderness impose their traditional knowledge and cultural values on the natural landscape via land use, forming a cultural landscape. Tangible culture in a form of built structures represents their cultural identity of existence on the sacred landscape of interest; or the culture is intangibly imposed by preserving the natural landscape on its initial virgin state as a sign of abstract divine sacredness (Hobbs, 1995). Monastic and/or religious complexes are usually surrounded by agricultural and irrigation systems of plots and orchards (i.e. leveled terraces for cultivation and balanced irrigation; water sources: rivers, water wells and springs; dams; conduits; imported soil; retaining fences). Around those agricultural systems, there are worship buildings and hermit cells, in addition to one and/or multiple-rooms complex(es)-dwelling(s). The cells and dwelling are erected under boulders, adjacent to cliffs or built as square house (Dahari, 2000). According to the remoteness and socioeconomic potentials of the sacred landscape, those factors indicate the potentiality of the land to attract more inhabitants, shifting the land from a rural landscape to a mixed rural-urban or an urban landscape. Under an increasing number of inhabitation and/or high socioeconomic potentiality, sacred landscapes undergo various geopolitical and/or socioeconomic transition phases which impact its natural and cultural elements of sacredness (Shams, 2010a, 2010b, 2011c, 2011d, 2011e, 2012a, 2012b).

On the other hand, the identification of a cultural landscape as a sacred land occurs after the creation of a rural, urban or mixed rural-urban landscape, and due to event(s) which are foreseen as a divine one(s), or due to a human declaration which is based on what sounds logic for the religious public and relatively logic for the inhabitation of interest, where one or more buildings act as a memorial and/or

Sacred landscape

worship place for both the successors-believers and the inhabitants of interest (i.e. socioeconomic interest). Usually, such sacred buildings are built over a sacred spot which is historically identified by the religious public as a location-spot of a religious event(s) and/or those buildings house sacred artifact(s) of meaningful religious evidence (e.g. relics or daily-use possessions of individuals who are perceived holy). The sacred buildings are usually located at the historical centre of rural, urban and mixed rural-urban areas, characterized by immense architecture which touches the sky, rising towards the worshiped and dominating the skyline of the whole vicinity, as a sign of sacredness and glory (Fig. 4-7) (Tab. 1).

Table 1 Socioeconomic timeline of the High Mountains of Sinai Peninsula
'Theme: Orchards = Maps'

Date	Socioeconomic Condition
Oldest settlement 'Tarfat El Qidarein': 35,000 BCE	
Climate: wet and cold	
Upper Paleolithic [Old Stone Age] (40,000 -17,000 BCE) (Harper Collins, 1998)	<i>Small bands</i> - <u>Hunters</u> - <u>Gatherers</u>
Climate: wet and cold → wet and cool	
Epi-paleolithic (17,000 - 8,500 BCE) (Harper Collins, 1998)	<i>Small mobile bands in the desert, inhabiting huts</i> - <u>Hunters</u> : fallow deer, hare, gazelle, ibex, wild cattle and wild boar - <u>Gatherers</u> : pulses and wild cereals
Climate: wet and cool - desert lakes at low elevated wadis	
Pre-Pottery Neolithic [New Stone Age] (8,500 - 6,000 BCE) (Harper Collins, 1998)	<i>Small bands: sedentary villagers</i> - <u>Agriculture</u> : emmer wheat, barely, pulses and figs - <u>Herdin</u> g: gazelles - <u>Hunting</u> : gazelles, fox, wild boar, cattle and Goat - <u>Gathering</u>
Climate: warm + little wetness	
Pottery Neolithic [New Stone Age] (6,000 - 4,700 BCE) (Harper Collins, 1998)	<i>Semi-permanent villages 'semi-mobilization'</i> - <u>Cultivation of crops</u>

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	<ul style="list-style-type: none"> - <u>Herding animals</u> - <u>Hunting</u> - <u>Gathering</u>
	Climate: dryness → wet summer rain → warm
Chalcolithic [Copper Age] (4,700 - 3,150 BCE) (Harper Collins, 1998)	<i>Sedentary villages 'tribal chiefdoms'</i> <i>(burials in corner of rooms and under floors)</i> <ul style="list-style-type: none"> - <u>Copper mining</u> - <u>Husbandry</u>
	Climate: constant; almost similar to nowadays
Bronze Age I (3150 BCE) (Beit-Arieh, 2003)	<i>Sedentary villages</i> <ul style="list-style-type: none"> - <u>Copper mining</u> - <u>Husbandry</u>: limited agriculture and seasonal herding cycle - <u>Trade</u>: animals and copper with South Canaan 'Land of Palestine'
-----	<ul style="list-style-type: none"> - <u>Sinaitic Law</u>: legal responsibility of the tribe, clan or family, but not on the direct legal responsibility of an individual
Early Bronze Age II (2925 BCE) (Beit-Arieh, 2003)	<ul style="list-style-type: none"> - <u>Migration of the 'Arab Canaanites'</u>: two cultures in South Sinai in the 3rd millennium BCE; the Canaanite and the local 'Muneto' cultures
2nd millennium BCE (Finkelstein et al. 1990)	<ul style="list-style-type: none"> - <u>Transportation</u>: camel replaced feral donkeys
1575- 1215 BCE? (Badra, 2000)	<ul style="list-style-type: none"> - Exodus of the Sons of Israel
1st century CE (Dahari, 2000) (Bourbon, 2000)	<ul style="list-style-type: none"> - <u>Sacredness</u>: identification of G. Musa as a sacred mountain by the Nabateans - <u>Trade</u>: Nabateans
337 CE (Manar Library, 2005)	<ul style="list-style-type: none"> - <u>Fortification</u>: the construction of the church and watchtower of the Burning Bush by Empress Helen
363 CE (Dahari, 2000)	<ul style="list-style-type: none"> - <u>Early pilgrimage</u>: identification of G. Musa as the Mountain of the Law by Julian Saba 'Syrian pilgrim'
373 CE	<ul style="list-style-type: none"> - <u>Saracens attacks on the monks</u>:

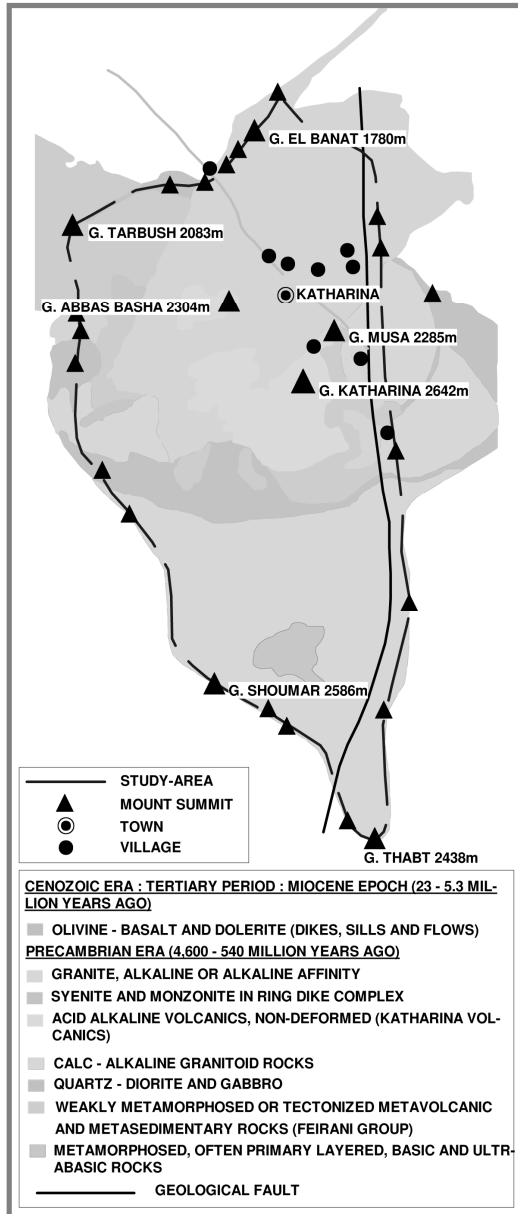


Figure 4 Geological formation; High Mountains of Sinai Peninsula (base map: Survey of Israel, Sinai Geological Map 'first edition' 1:500 000, 1980); Sinai Peninsula Research 2000-2010 CE

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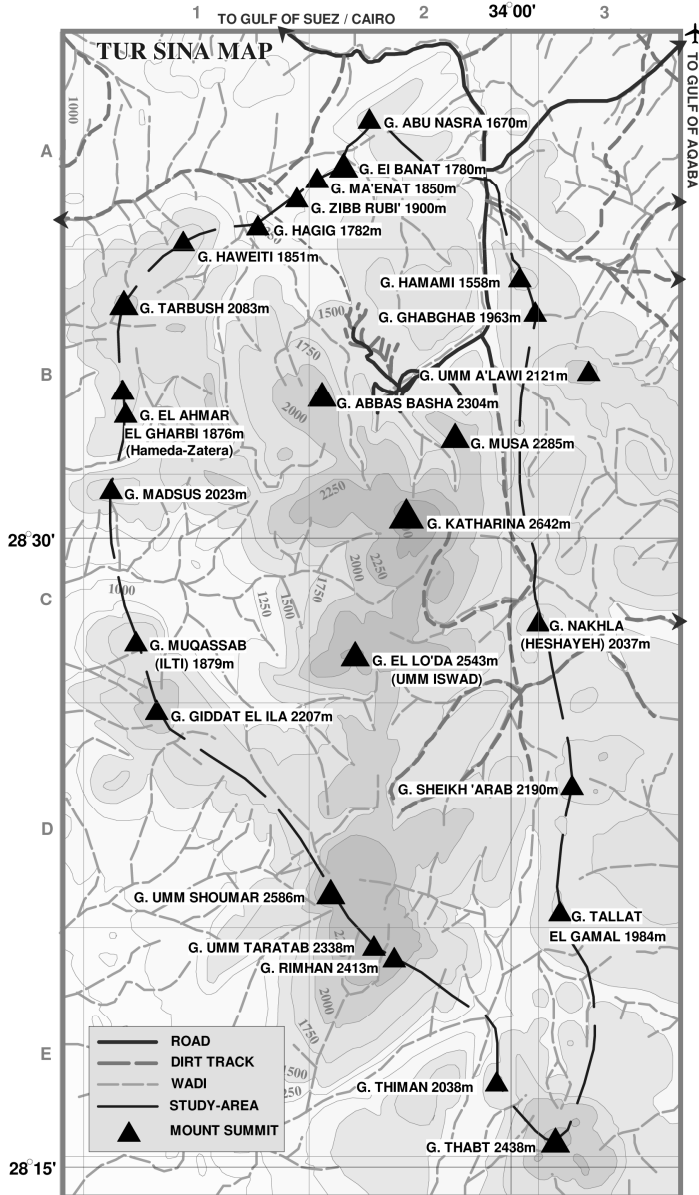


Figure 5 Study-area; High Mountains of Sinai Peninsula (base map: War Office and Air Ministry 1956/US Army Map Service 1952, 1:250 000): Sinai Peninsula Research 2000-2010 CE

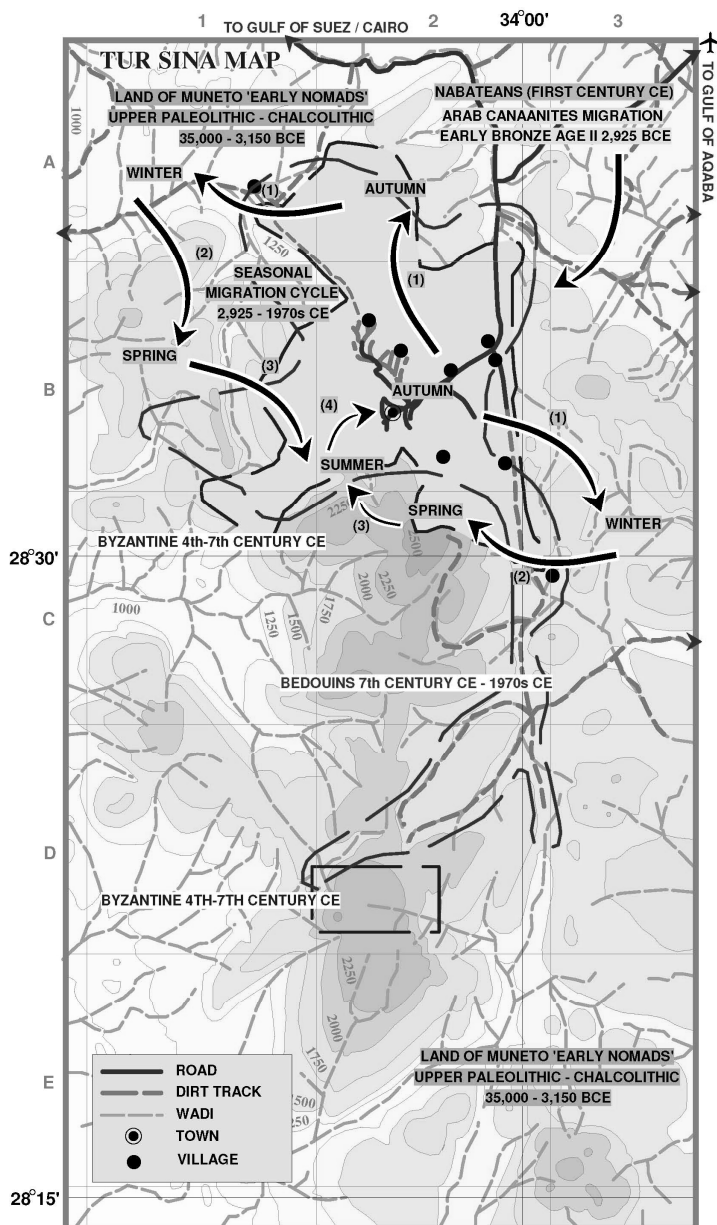


Figure 6 Migration pattern; High Mountains of Sinai Peninsula (base map: War Office and Air Ministry 1956/US Army Map Service 1952, 1:250 000); Sinai Peninsula Research 2000-2010 CE

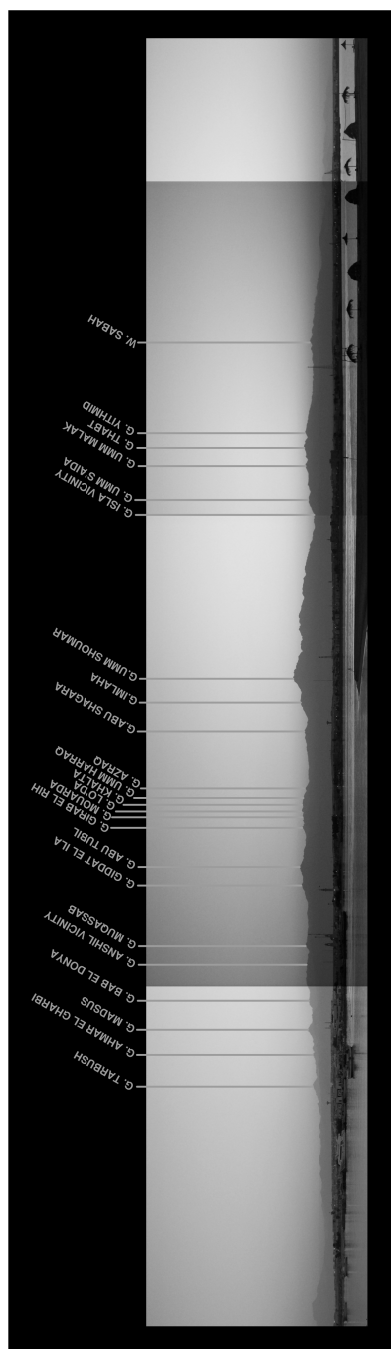


Figure 7 High Mountains of Sinai Peninsula panoramic view at Tur City 'Gulf of Suez': Sinai Peninsula Research 2000-2010 CE

Sacred landscape

(Shuqier, 1917)	mentioned by Ammonius the monk of Alexandria
383-384 CE (Dahari, 2000)	<ul style="list-style-type: none"> - <u>Monasticism</u>: identification of the Sinaitic monastic settlements by Egeria 'pilgrim' (Fig. 8 & 9) - <u>Mountainous agriculture</u>: orchards
4th-7th century CE (Dahari, 2000)	<ul style="list-style-type: none"> - <u>Population</u>: peak of Sinaitic monasticism; 530-600 monks
400 CE (Shuqier, 1917)	<ul style="list-style-type: none"> - <u>Saracens attacks on the monks</u>: mentioned by Nilus of Constantia
491-518 CE (Dahari, 2000)	<ul style="list-style-type: none"> - <u>Fortification</u>: the construction of another watchtower by Emperor Anastasius I
530-545 CE (Shuqier, 1917)	<ul style="list-style-type: none"> - <u>Fortification</u>: the construction of the Holy Monastery of Tur Sina 'Mount Sinai' by Emperor Justinian and the arrival of the 200 Roman soldiers 'origin of the Gebaliya tribe'
Mid 6th - mid 7th century CE (Ahmed, 2004)	<ul style="list-style-type: none"> - <u>Sinaitic Law</u>: Gebaliya legal responsibility of the tribe, clan or family, but not on the direct legal responsibility of an individual
----- (Hobbs, 1995)	<ul style="list-style-type: none"> - <u>Ownership of land</u>: all land within a three-and-one-third day camel ride from the monastery belongs to the monastery
2nd half of 6th century CE (Dahari, 2000)	<ul style="list-style-type: none"> - Identification of the Holy Monastery of Tur Sina 'Mount Sinai' by Procopius of Caesarea
580-603 CE (Catholic Encyclopedia Reports 1907-1914)	<ul style="list-style-type: none"> - <u>Monastic spirituality</u>: the Ladder of Divine Ascent by John Climacus 'Abbot of Sinai Monastery'
7th century CE (Shuqier, 1917)	<ul style="list-style-type: none"> - <u>Trustee</u>: guarantee of safety for the monks by Prophet Mohamed of the Muslims
639-641 CE (Shuqier, 1917) (Gohary, 1961) (Ahmed, 2004)	<ul style="list-style-type: none"> - <u>Migration of the Arab tribes</u> - <u>Semi-Arab tribe</u>: the Arab conquest and the early formation of the Gebaliya tribe (i.e. Awlad Gindi 'sons

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	of the soldier', El Wahybat, El Hamida and El Salayma)
2nd half of 7th century CE (Ahmed, 2004) (Shams, 2011e)	<ul style="list-style-type: none"> - <u>Tribal Law</u>: Sinaitic law was developed to the current version due to the migration of several Muslim Arab tribes to Sinai Peninsula - <u>Law</u>: the Holy Monastery of St. Catherine as a historical high judgment court
996-1020 CE (Shuqier, 1917)	<ul style="list-style-type: none"> - <u>Violation and Trustee</u>: unexecuted violation, then a guarantee of safety for the monks by the Fatimid king Hakim Be-amr Allah
1101-1130 CE (Shuqier, 1917)	<ul style="list-style-type: none"> - <u>Monastery's mosque</u>: construction by the Fatimid king El Amer Bahkam Allah
1008 CE (Bailey, 1985)	<ul style="list-style-type: none"> - <u>Semi-Arab tribe</u>: Gebaliya tribe under the protection of Sawalha and 'Awarmah tribes
1020 CE (Shuqier, 1917) (Lavie, 1991)	<ul style="list-style-type: none"> - <u>Arab tribe</u>: the major conversion of the Romanian soldiers to Islam (i.e. tribal structure: 'agab; rba'; fara'; nabaz; khamsa)
1169 CE (Shuqier, 1917)	<ul style="list-style-type: none"> - <u>Trustee</u>: guarantee of safety for the monks by Fatimid king El 'Adid Li-Din Allah
1336 CE (Hobbs, 1995)	<ul style="list-style-type: none"> - <u>Early western travelers</u>: Wilhelm Baldensel and Ludolf Von Suchem - <u>Transportation</u>: pilgrims and travelers
	<u>Economy of the Gebaliya tribe</u>
	<i>Main economy</i>
	<ul style="list-style-type: none"> - <u>Transportation</u>: pilgrims and travelers
	<i>Supportive economy</i>
Mid 14th century CE (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)	<ul style="list-style-type: none"> - <u>Mountainous agriculture</u>: orchards' goods (i.e. local consumption + trade) (Fig. 10-15)

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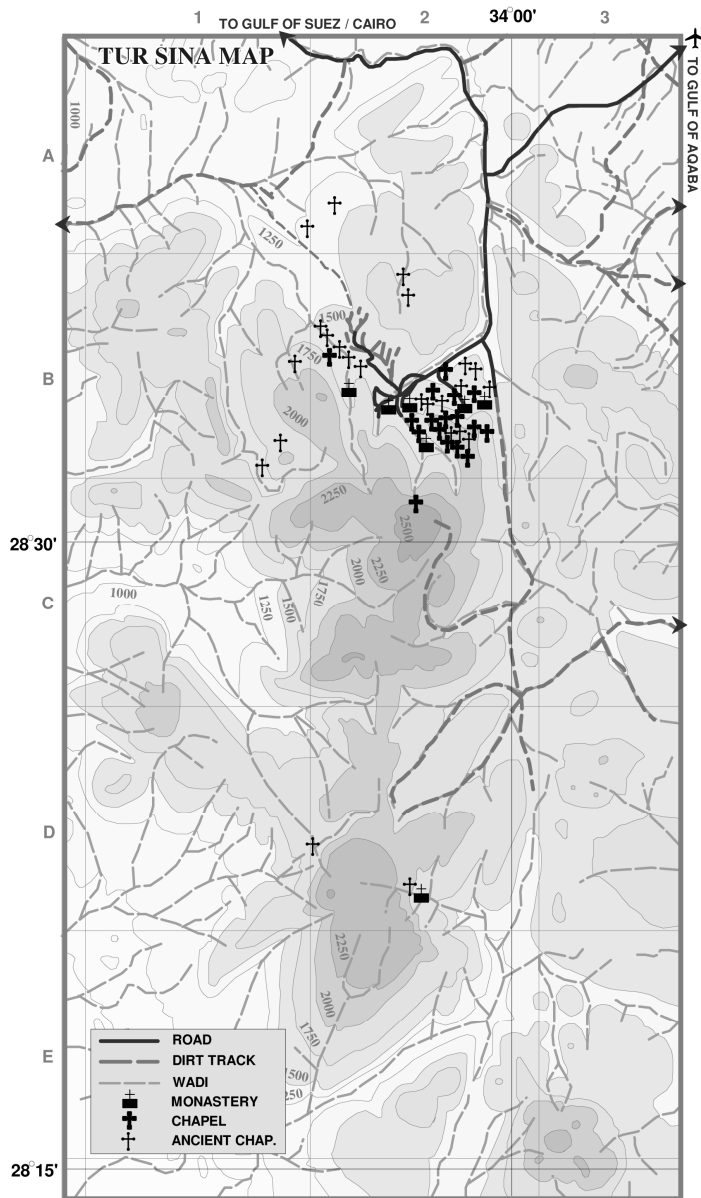


Figure 9 Chapels-monastery(ies); High Mountains of Sinai Peninsula (base map: War Office and Air Ministry 1956/US Army Map Service 1952, 1:250 000): Sinai Peninsula Research 2000-2010 CE

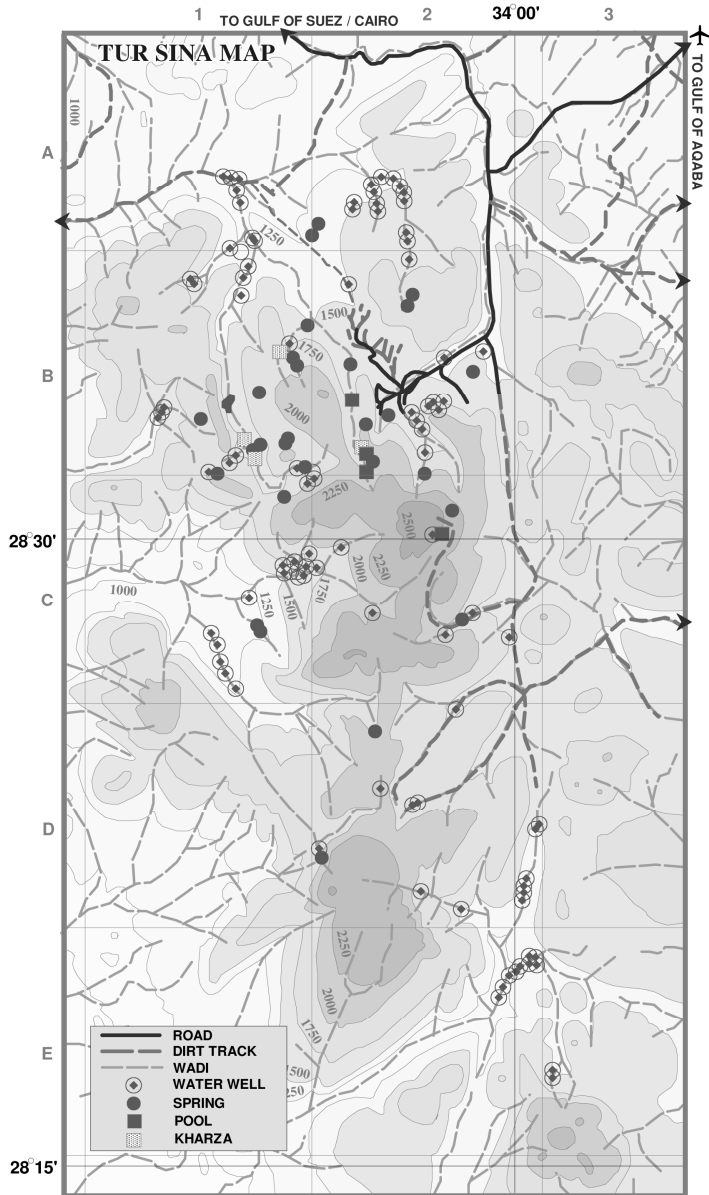


Figure 10 Ground water resources; High Mountains of Sinai Peninsula (base map: War Office and Air Ministry 1956/US Army Map Service 1952, 1:250 000): Sinai Peninsula Research 2000-2010 CE

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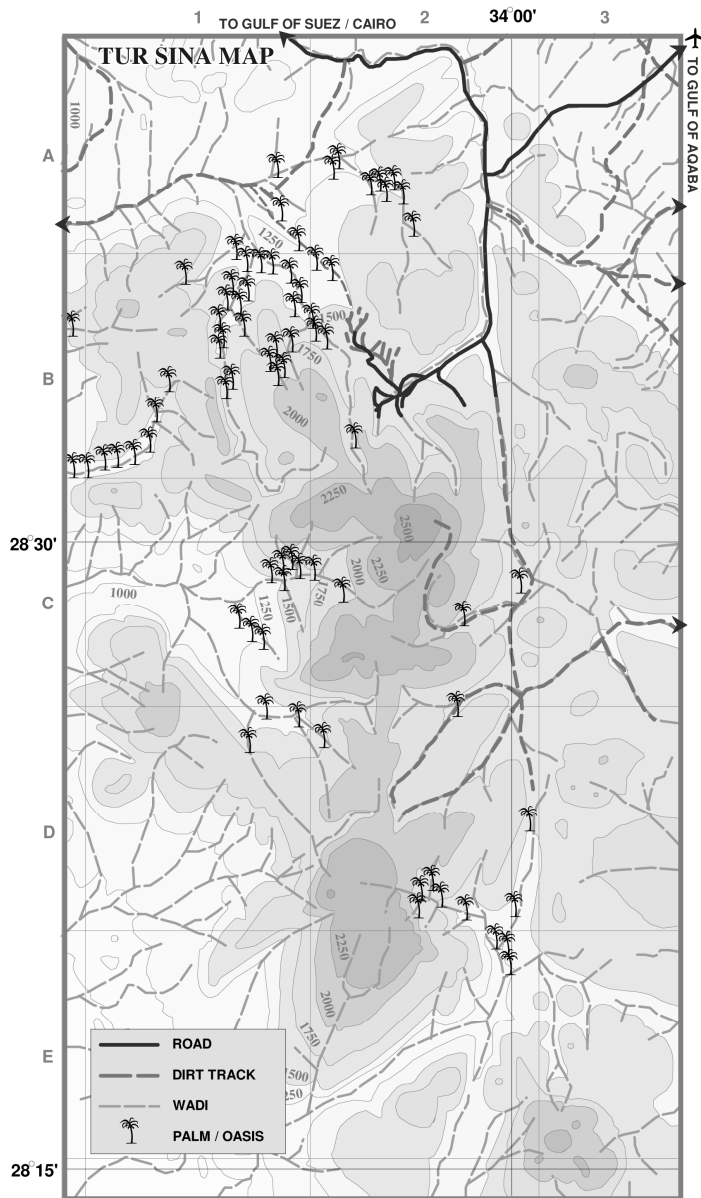


Figure 11 Oases-palm areas; High Mountains of Sinai Peninsula (base map: War Office and Air Ministry 1956/US Army Map Service 1952, 1:250 000); Sinai Peninsula Research 2000-2010 CE

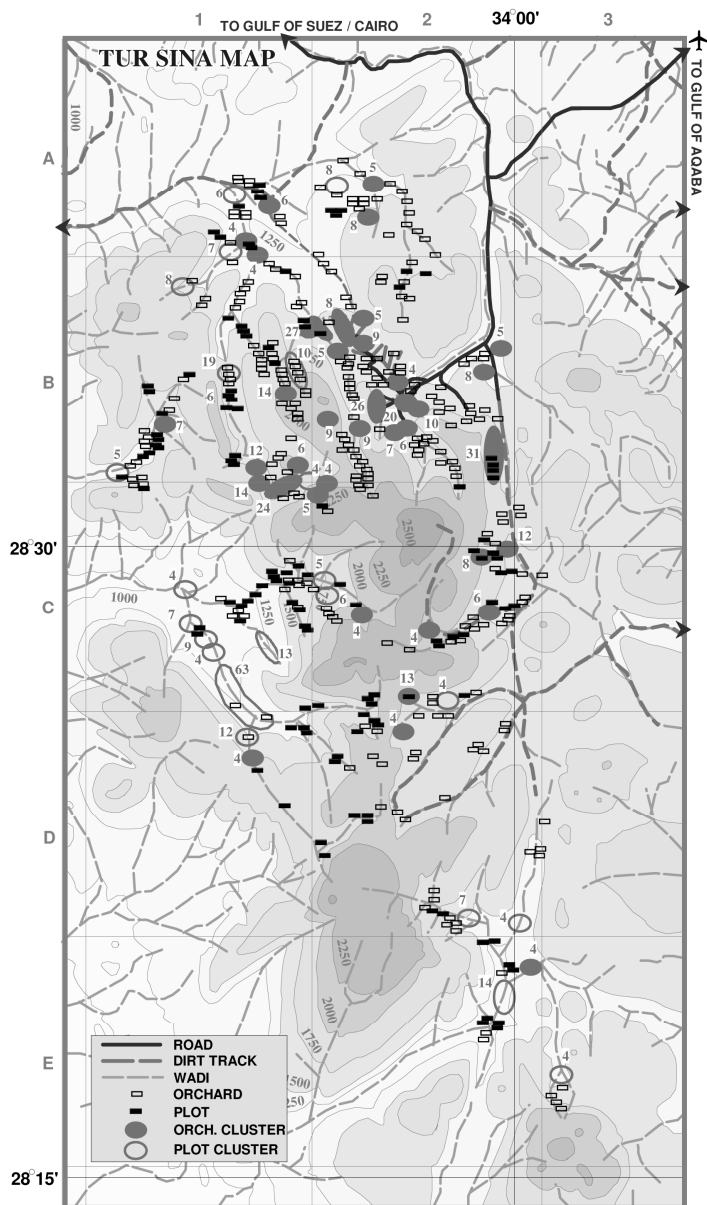


Figure 12 Orchards-agricultural plots; High Mountains of Sinai Peninsula (base map: War Office and Air Ministry 1956/US Army Map Service 1952, 1:250 000): Sinai Peninsula Research 2000-2010 CE

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(a - 1900-1920 CE)



(b - 2010 CE)

Figure 13 Orchards 'mountainous agriculture' of the Gebaliya Bedouins at Wadi Tilah 'Rudhwah' 1400-1500m ASL: (a) by American Colony of Jerusalem in 1900-1920 CE; (b) by Sinai Peninsula Research '2000-2010' in August 2010 CE



(a - 2009 CE)



(b - 2009 CE)

Figure 14 Orchards 'mountainous agriculture' of the Gebaliya Bedouins: (a) Orchard 'O8 - Tur Sina Map' at W. Tubuq 'Ain Shekya vicinity' 1790m ASL on 19th of June 2009 CE; (b) Orchard 'O190/A'uda - Tur Sina Map' at W. Shagg 1820m ASL on 20th of June 2009 CE: Sinai Peninsula Research 2000-2010 CE



(a - 2010 CE)



(b - 2010 CE)

Figure 15 Orchards irrigation system 'Gebaliya Bedouins' in the High Mountains of Sinai Peninsula 1570m ASL in August 2010 CE: (a) the small water dam of Orchard 'O71 - Tur Sina Map' at W. Quweiz, W. Tilah 'Rudhwah' and W. El Tala'a El Saghera; (b) Makhad Trust water dam nearby Orchards 'O70/O72 - Tur Sina Map' at W. Tilah 'Rudhwah': Sinai Peninsula Research 2000-2010 CE

Sacred landscape

	<ul style="list-style-type: none"> - <u>Herding</u>: seasonal cycle 'Arabic: rihla' (i.e. local consumption + trade) (Fig. 16) - <u>Charcoal</u>: acacia and tamarisk trees (i.e. local consumption + trade) - <u>Hunting</u> (i.e. local consumption) (Fig. 17)
1517-1820 CE (Shuqier, 1917)	<ul style="list-style-type: none"> - <u>Transportation</u>: Gebaliya tribe is forced by the Ottoman Sultan Selim I to send 100 camels/year to Arabia for the transportation of goods
1581-1585 CE (Ahmed, 2004)	<ul style="list-style-type: none"> - <u>Ownership of land</u>: three declarations came to prohibit the Jews from settling in Sinai after the practical attempt of Abraham the Jew in the town of El Tur
1585-1694 CE (Stewart, 1991)	<ul style="list-style-type: none"> - <u>Payments policy</u>: firstly recorded payment by the monastery to the Bedouin tribes
1592-1826 CE (Shuqier, 1917)	<ul style="list-style-type: none"> - <u>Law</u>: the Holy Monastery of St. Catherine as a historical high judgment court being supported by the consecutive rulers-governments of Egypt; Tur Fortress judgment court of South Sinai
± 17th century CE (Lavie, 1991)	<ul style="list-style-type: none"> - <u>Alliance</u>: Tawara Tribal Alliance (i.e. Mezena, 'Aliqat, Hamada and Bani Wasel + Awlad Sa'aed, Qrarsha and Sawalha + Gebaliya); date harvest annual meeting at W. Feiran, the centre of South Sinai tribal politics - <u>Law</u>: supreme court of the Tawara Tribal Alliance is consisted of three judges/tribe
1618 CE (Shuqier, 1917)	<ul style="list-style-type: none"> - <u>Trustee</u>: guarantee of safety for the monks by the Ottoman Sultan Mustafa Khan I
1750 CE (Burckhardt, 1816)	<ul style="list-style-type: none"> - <u>Arab tribe</u>: death of the last Christian individual of the Gebaliya tribe



(a - 1898-1946 CE)



(b - 2009 CE)

Figure 16 Herding traditional supportive-economical activity: (a) Gebaliya Bedouin shepherd at El Melga Plain 1520-1570m ASL in 1898-1946 CE: American Colony of Jerusalem; (b) Gebaliya Bedouins' herd at W. Tilah 'Rudhwah' 1350-1400m ASL in August 2010 CE: Sinai Peninsula Research 2000-2010 CE

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(a - 1913 CE)



(b - 2009 CE)

Figure 17 (a) Gebaliya Bedouins holding their rifles on the summit of Mount Sinai 'G. Musa' 2285m ASL on 15th of April 1913 CE 'guarding-hunting tradition': Underwood & Underwood; (b) Head of an ibex 'Capra Ibex' at Serabit El Khadem 'south-western vicinity of Sinai Peninsula' in January 2009 CE: Sinai Peninsula Research 2000-2010 CE

Human Occupation Development

20th of December 1799 CE (Shuqier, 1917)	- <u>Trustee</u> : guarantee of safety for the monks by Napoleon Bonaparte of the Republic of France
Late 18th - early 19th centuries CE (Shuqier, 1917)	- <u>Transportation agreements</u> : Gebaliya shared the benefits with the 'Aliqat, 'Awarmah and Awlad S'aed tribes - <u>Monks</u> : Gebaliya tribe had the right to transport serials, luggage and monks of the monastery without benefits share with any other tribe
1st of November 1800 CE (Shuqier, 1917)	- <u>Trustee</u> : guarantee of safety for the monks by commander Dames of the Republic of France
1810s CE (Rabinowitz, 1985)	- <u>Law</u> : Mohamed Ali the ruler of Egypt forces order in Sinai Peninsula
1823 CE (Rabinowitz, 1985)	- <u>Administration</u> : Mohamed Ali the ruler of Egypt forces a hefty fine paid by the Bedouins in terms of charcoal
1830s CE (Rabinowitz, 1985)	- <u>Western influence</u> : increasing European interest in Sinai Peninsula, reflected in the increasing number of travelers
1853 CE (Ahmed, 2004)	- <u>Law</u> : Egyptian government started to encourage the Bedouins to stop following the tribal laws and to start working with the civilian ones by presenting their deputies in front of the governments' courts
1849-1854 CE (Shuqier, 1917) (Hobbs, 1995)	- <u>Royal interest</u> : construction of Siqqat Abbas Basha to the summit of G. Musa and Qasr Abbas Basha by the Khedive of Egypt Abbas Helmi I
1865 CE (Attia, 1952)	- <u>Cultural heritage loss</u> : the German scholar Tischendorff borrowed Codex Sinaiticus 'the world's most ancient codex' under the name of the czar of Russia
1866-1909 CE (Hobbs, 1995)	- <u>Environmental threat</u> : frequent drought period of 3 to 4 years
1884 CE	- <u>Western influence</u> : increasing British

Sacred landscape

(Shuqier, 1917) (Rabinowitz, 1985)	<p>interest in Sinai Peninsula</p> <ul style="list-style-type: none"> - <u>Administration</u>: British military authority in Sinai Peninsula 'War Ministry'
<p>1890 CE (Ahmed, 2004)</p>	<ul style="list-style-type: none"> - <u>Law</u>: the transfer of the deputed of South Sinai inhabitants to an identified court in the Nile Valley
<p>28th of June - 7th of July 1890 CE (Ahmed, 2004)</p>	<ul style="list-style-type: none"> - <u>Ownership of land</u>: declaration of the Ottoman Sultan Abd El Hamid II to prohibit the Zionists from settling in the lands of the Ottoman Empire
<p>1890s CE (Rabinowitz, 1985)</p>	<ul style="list-style-type: none"> - <u>Tourism 'early tourists'</u>: hunting expeditions in the High Mountains of the Sinai Peninsula mounted by English gentry 'across the peninsula'
<p>1891-1892 CE (Ahmed, 2004)</p>	<ul style="list-style-type: none"> - <u>Ownership of land</u>: Zionist attempt by Paul Friedman, the German Protestants to settle in the town of El Tur
<p>1893 CE (Ahmed, 2004)</p>	<ul style="list-style-type: none"> - <u>Payments policy</u>: determination of the salaries for the Bedouin sheikhs of Central and South Sinai - <u>Administration</u>: governmental and traditional tribal Bedouin sheikhs
<p>23rd of March 1893 CE (Ahmed, 2004)</p>	<ul style="list-style-type: none"> - <u>Administration</u>: South Sinai under Suez Governorate and being supervised by Nakhl Fortress
<p>1896 CE (Shuqier, 1917) (Ahmed, 2004)</p>	<ul style="list-style-type: none"> - <u>Administration</u>: town of El Tur is the nearest governmental centre to the High Mountains of Sinai Peninsula 'Tur-Suez cities telegraph line'; post was transferred once/month by land, once/week by the Khedivial Ships Co. and twice/week during the Muslim's pilgrimage season to Mecca
<p>1898-1946 CE (http://www.loc.gov/)</p>	<ul style="list-style-type: none"> - <u>Tourism and Black-White Photography</u>: American colony of Jerusalem Photo Department in the Holy Land
<p>23rd of December 1904 CE</p>	<ul style="list-style-type: none"> - <u>Trustee</u>: guarantee of safety for the

Human Occupation Development

(Shuqier, 1917)	monks by the Ottoman Sultan Abd El Hamid
1907-1914 CE (Ahmed, 2004)	<ul style="list-style-type: none"> - <u>Administration</u>: the declaration of Sinai Peninsula as a governorate - <u>Transportation agreement</u>: <u>Gebaliya</u>: the members of the tribe shared in the transportation of the travelers outside their territory <u>Other tribes</u>: earned higher wages for transportation
Friday, 8th of January 1909 CE (Shuqier, 1917)	
1910-1913 CE (Rabinowitz, 1985)	<ul style="list-style-type: none"> - <u>Wage labor</u>: prospecting and construction of the manganese mines of Abu Zeneima
1911 CE (Ahmed, 2004)	<ul style="list-style-type: none"> - <u>Administration</u>: the government assigned 100 Egyptian Pounds per annum for the monastery in return for its services to the Bedouin community
1st of June 1911 CE (Ahmed, 2004)	<ul style="list-style-type: none"> - <u>Law</u>: the declaration of Sinai Peninsula law no. 15 under the Desert Governmental Law, based on the tribal law
1913 CE (Ahmed, 2004)	<ul style="list-style-type: none"> - <u>Administration</u>: the government increased the amount to 400 Egyptian Pounds per annum for the monastery in return for its services to the Bedouin community
1914-1918 CE (Glassner, 1974) (Perevolotsky, 1981) (Rabinowitz, 1985) (Perevolotsky et al., 1989) (Lavie, 1991) (Hobbs, 1995) (Marx, 2003) (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)	<p><u>Post World War I 'WWI' economical transition for the Gebaliya tribe due to military actions</u></p> <p><i>Main economy (decline)</i></p> <ul style="list-style-type: none"> - <u>Transportation</u>: declined and limited to the High Mountains of Sinai Peninsula (Fig. 18 & 19) <p><i>Supportive economy (partial local rise)</i></p> <ul style="list-style-type: none"> - <u>Wage labor</u>: mainly in Holy Monastery of St. Catherine; centralized accessibility to the manganese mines via the



(a - 1916 CE)



(b - 1917-1918 CE)

Figure 18 Military administration/occupation in Sinai Peninsula: (a) the East Lancashire regiment in 1916 CE: British Army Archive; (b) Turkish troops in 1917-1918 CE: American Colony of Jerusalem

Human Occupation Development



(a - 1898-1946 CE)



(b - 1925-1946 CE)

Figure 19 (a) Traditional transportation in the remote inaccessible areas of the High Mountains of Sinai Peninsula at W. Zeraiqiya (G. Madsus) 2000m ASL in 1898-1946 CE: American Colony of Jerusalem; (b) Motor vehicles replaced camels in low-elevated valleys at W. Feiran in 1925-1946 CE': American Colony of Jerusalem

Sacred landscape

	<p>governmental sheikhs (limited) 'the formation of South Sinai mining economical belt, Gulf of Suez' (Fig. 20)</p> <ul style="list-style-type: none"> - <u>Mountainous agriculture</u>: local consumption; 100 families worked 300 orchards (rise) - <u>Herdin</u>: local consumption; sheep and goat; meat and milk (rise) - <u>Charcoal</u>: local consumption (decline) - <u>Hunting</u>: local 'Fox, Hyrax, Hare, Hyena, Ibex, Cat Felis, Wolf, Feral Donkey and Leopard' (low profile)
1917 CE (Shuqier, 1917)	<ul style="list-style-type: none"> - <u>Population</u>: Gebaliya tribe '480 individuals' (Fig. 21)
1920s CE (Hobbs, 1998)	<p><i>Illegal economy</i></p> <ul style="list-style-type: none"> - <u>Smuggling</u>: Turkish, Lebanese and Syrian opium via North Sinai
1920s-1930s CE (Rabinowitz, 1985)	<p><i>Main economy</i></p> <ul style="list-style-type: none"> - <u>Transportation</u>: motor vehicles replaced camels
1932-1939 CE (Hobbs, 1995)	<p><i>Supportive economy</i></p> <ul style="list-style-type: none"> - <u>Charcoal</u>: replaced by oil and gas - <u>Scientific research infrastructure</u>: G. Katharina weather station of Smith Metrological Museum of California
1933 CE (Aphanglous, 1984)	<p><u>Cultural heritage loss</u>: the British Museum bought Codex Sinaiticus for 100,000 sterling pounds</p>
1940s-1950s CE (Hobbs, 1995)	<p><i>Supportive economy</i></p> <ul style="list-style-type: none"> - <u>Mountainous agriculture</u>: local consumption - <u>Herdin</u>: local consumption
1944-1954 CE (Perevolotsky, 1981)	<ul style="list-style-type: none"> - <u>Environmental threat</u>: introduction of water pumps
1948 CE (Lavie, 1991)	<ul style="list-style-type: none"> - <u>Administration</u>: Palestine War and the reinforcement of the British-Egyptian military authorities in Sinai Peninsula - <u>Migration</u>: unspecified considerable

Human Occupation Development

1950s CE

(Lavie, 1991) (Hobbs, 1995)

1950s-1960s CE

(Glassner, 1974) (Rabinowitz, 1985)
(Lavie, 1991) (Hobbs, 1995) (Hobbs, 1998) (Marx, 1999) (Marx, 2003)
(Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)

First half of the 1950s CE

(Mubasher, 1978) (Lavie, 1991)

1956 CE

(Lavie, 1991)

1963 CE

(PAMU, 2003)

Mid 1960s-1970 CE

(Hobbs, 1995)

1965 CE

(Gohary, 1965)

(Lavie, 1991)

number of Negev Bedouins moved into Sinai Peninsula

- Distribution of subsidized goods 'centralized distribution in the town of Abu Rudeis': the Egyptian government introduced into the Sinai a centralized system for distributing subsidized basic goods via the governmental sheikhs at the town of Abu Rudeis, such as floor, rice cooking oil, tea and sugar, supported by the United Nations Relief and Works Agency 'UNRWA'

Supportive economy

- Wage labor: relatively increasing opportunities in the manganese mines of Abu Zeneima and the oilfields on the Gulf of Suez

Illegal economy

- Smuggling: 30% of South Sinai economy

- Transportation: the establishment of the Gulf of Suez road by the Egyptian government

- Administration: Suez Crisis and the reinforcement of the Egyptian military-civil authority in Sinai Peninsula; the formation of an initial development policy; Abu Rudeis as an Egyptian government Bedouin contact point at South Sinai

Supportive economy

- Herding: average of 35 goats and sheep/household?

- Environmental threat: leopards got extinct

- Population: Gebaliya tribe '500 individuals'? Awlad S'aed tribe '1,000 individuals'

- Broadcast: the critical role of the Radio as the source of news for



(a - 1900-1920 CE)



(b - 1981 CE)

Figure 20 Mining wage labor economy on the Gulf of Suez: (a) Manganese exporting harbor of Abu Zeneima in 1900-1920 CE: American Colony of Jerusalem; (b) Abu Rudeis oilfields in 1981 CE 'operating Since 1957 CE (Arabic Ref.: Sinai Encyclopedia, 1982): Kevin Fleming

Human Occupation Development

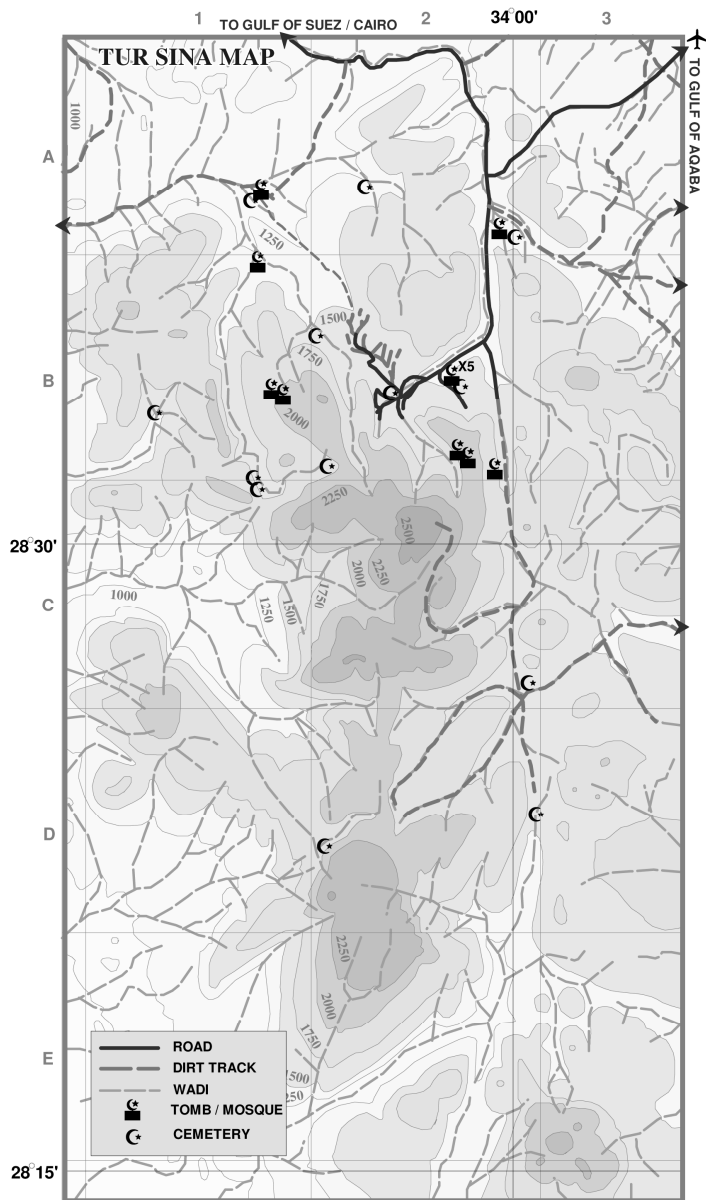


Figure 21 Sheikhs' tombs-Bedouin cemetery(ies); High Mountains of Sinai Peninsula (base map: War Office and Air Ministry 1956/US Army Map Service 1952, 1:250 000); Sinai Peninsula Research 2000-2010 CE

Prior 1967 CE
 (Glassner, 1974) (Rabinowitz, 1985)
 (Lavie, 1991) (Hobbs, 1995)
 (UNDP, 2002) (Marx, 2003)
 (Shams, 2010a, 2010b, 2011b, 2011c,
 2011d, 2011e, 2011f, 2012a, 2012b,
 2012c)

1967 CE
 (Glassner, 1974) (Perevolotsky, 1981)
 (Rabinowitz, 1985) (Perevolotsky et
 al., 1989) (Lavie, 1991) (Hobbs, 1995)
 (Hobbs, 1998) (Marx, 1999) (Marx,
 2003) (Shams, 2010a, 2010b, 2011b,
 2011c, 2011d, 2011e, 2011f, 2012a,
 2012b, 2012c)

remote settlements

Supportive economy

- Herding: average of 60 goats and sheep/household?

Market for the goods of the High Mountains of Sinai Peninsula

- Monastery
- Pilgrims and travelers
- Sinaitic tribes
- Tur market for Muslim pilgrims heading to Mecca (i.e. historical status)
- Mining localities on the Gulf of Suez
- Bedouin fishery localities on the Gulf of Aqaba
- Cities on the Suez Canal

Post Six Days War economical transition for the Gebaliya tribe due to military actions

Main economy (rise)

- Transportation → tourism: Eco-cultural tourism in the High Mountains of Sinai Peninsula 'the formation of South Sinai tourism economical belt, St. Catherine - Gulf of Aqaba' (Fig. 22)
- Wage labor: oilfields, civilian-military construction, mechanics and tourism services 'decentralized-sole implementation'

Supportive economy (decline)

- Mountainous agriculture: local consumption; 30-40 families worked 120 orchards (decline)
- Herding: local consumption; sheep and goat; meat and milk (decline)
- Charcoal: local consumption (limited by law)
- Hunting (prohibited)

Human Occupation Development

	<p><i>Illegal economy (relatively considerable)</i></p> <ul style="list-style-type: none"> - <u>Smuggling</u>: the Israeli military administration moderates the smuggling activities against the Nile Valley (regulated)
<p>1967-1972 CE (Lavie, 1991)</p>	<p><i>Low development profile 'investment'</i></p>
<p>1968 CE (Lavie, 1991) (Hobbs, 1995)</p>	<p><i>Main economy</i></p> <ul style="list-style-type: none"> - <u>Tourism accommodation facility</u>: El Raha Tourists Camp - <u>Cinema</u>: first movie screened for Bedouin public 'W. Feiran'
<p>Early 1970s-Mid 1980s CE (Lavie, 1991) (Marx, 2004)</p>	<ul style="list-style-type: none"> - <u>Market</u>: Arish roving merchants (i.e. 'Arishien')
	<p><i>Supportive economy</i></p> <ul style="list-style-type: none"> - <u>Herding</u>: average livestock/family is 2-3 sheep, 4-6 goats and 1 camel
<p>1970s CE (Glassner, 1974) (Rabinowitz, 1985) (Lavie, 1991) (Hobbs, 1995)</p>	<ul style="list-style-type: none"> - <u>Administration</u>: Israeli military authority; the monastery's partial loss of influence on land, although it is always perceived by the Bedouins as the most stable authority on land; governmental, economical and traditional tribal Bedouin sheikhs '30 sheikhs were appointed by the Israelis, among them 20 previously appointed ones by the Egyptians' - <u>Airport</u>: El U'rfan 'St. Catherine' Airport - <u>Clinic</u>: El Melga - El Raha Plains; introduction of the ambulance helicopters for the Bedouins (Fig. 23) - <u>Distribution of subsidized goods 'decentralized distribution'</u>: Israeli Military Administration continued the distribution of subsidized basic goods such as flour, sugar, cooking oil and rice (i.e. source: United States Agency for International Development 'USAID') - <u>Cultural heritage loss</u>: relative replacement of the traditional healers



(a - 1980 CE)



(b - 2009 CE)

Figure 22 (a) Motor vehicles replaced camels in low-elevated valleys 'Sinai Peninsula - Israeli eco-cultural tourism' in 1980 CE: Dirk Vermeulen; (b) Traditional transportation in the remote inaccessible areas of the High Mountains of Sinai Peninsula at Naqb El Feraish on 11th of March 2009 CE: Sinai Peninsula Research 2000-2010 CE



(a - Late 1960s CE)



(b - Late 1960s - 1970s CE)

Figure 23 Israeli military administration/occupation in Sinai Peninsula: (a) Local clinic at W. Feiran 'Ministry of Health, State of Israel' in late 1960s CE: Spielberg Jewish Film Archive; (b) St. Catherine NGO office 'South Sinai Command' 1570m ASL in late 1960s -1970s CE: unknown source

Sacred landscape

	<p>by chemical medicine</p> <ul style="list-style-type: none"> - <u>Law</u>: first application of nature conservation laws 'Israeli Federal Agency for Nature Reserves' - <u>Old-new settlement 'semi-modern'</u>: town of Katharina in El Melga Plain (Fig. 24-27) - <u>Training</u>: Al Arish city on the Mediterranean coast in North Sinai and Eilat city on the Gulf of Aqaba 'construction, mechanics and tourism' - <u>Transportation</u>: shuttle service between St. Catherine and the Gulf of Aqaba operated by Bedouins
1970s-1997 CE (SSRDP, 2006b)	<p><i>Main economy</i></p> <ul style="list-style-type: none"> - <u>Tourism</u>: average number of Israeli hikers/year = 12,000 <p><i>Illegal economy</i></p> <ul style="list-style-type: none"> - <u>Smuggling</u>: Israeli military administration totally prohibits smuggling in Sinai Peninsula
1972 CE (Lavie, 1991) (Zalat et al., 2008)	<ul style="list-style-type: none"> - <u>Population</u>: Gebaliya tribe '1,245 individuals' - <u>Transportation</u>: the establishment of the Gulf of Aqaba road by the Israeli military administration
1972-1979 CE (Lavie, 1991)	<p><i>Relatively high development profile 'investment'</i></p> <ul style="list-style-type: none"> - <u>NGO</u>: the Administration of the Development of King Solomon's Wilderness; Israeli Society for Nature Protection
1974 CE (Lavie, 1991) (Hobbs, 1995)	<ul style="list-style-type: none"> - <u>Scientific research infrastructure</u>: Tzukei David Field Study Center
1974-1977 CE (Perevolotsky, 1981)	<p><i>Supportive economy</i></p> <ul style="list-style-type: none"> - <u>Mountainous agriculture</u>: 440 orchards inside the ring dike; 231 belonged to 170 families; 25% of the families owned none and 10-12% shared orchards

Human Occupation Development

Mid 1970s CE (Hobbs, 1995)	<p style="text-align: center;"><i>Main economy</i></p> <ul style="list-style-type: none"> - <u>Tourism accommodation facility</u>: Abu Zeituna Tourists Camp
1975 CE (Lavie, 1991) (Hobbs, 1995)	<p style="text-align: center;"><i>Main economy</i></p> <ul style="list-style-type: none"> - <u>Tourism facility</u>: El Melga Tourists Center
Late 1970s (Lavie, 1991)	<p style="text-align: center;"><i>Main economy</i></p> <ul style="list-style-type: none"> - <u>Tourism</u>: Israeli desert treks is 10,000-20,000 days/year - <u>Hospital</u>: St. Catherine's clinic was transformed into a community hospital '<i>visiting consultants: Sheba Medical center near Tel Aviv</i>'
1978 CE (Dames & Moore 'USAID', 1979-1985) (Rabinowitz, 1985) (Hobbs, 1995)	<p style="text-align: center;"><i>Main economy</i></p> <ul style="list-style-type: none"> - <u>Tourism</u>: 50,000 visitors - <u>Tourism accommodation facility</u>: W. Arba'ien Monastery's Hostel - <u>Museum</u>: El Melga Ethnographic Museum
29th of November 1978 - 14th of May 1980 CE (SEAM, 2003-2004)	<ul style="list-style-type: none"> - <u>South Sinai governor (Egypt - further on)</u>: Farid Ezzat Wahba
1979 CE (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c) (Multinational Force and Observers 'MFO', 1986a, 1986b, 1986c, 1986d, 1989, 1990)	<ul style="list-style-type: none"> - <u>Peace Treaty</u>: Camp David between Egypt and Israel
November 1979-25 January 1980 CE (Hobbs, 1995)	<ul style="list-style-type: none"> - <u>Peace Treaty</u>: Israel withdrew from the High Mountains of Sinai Peninsula (Fig. 28)
15th of May 1980 - 15th of March 1983 CE (SEAM, 2003-2004)	<ul style="list-style-type: none"> - <u>South Sinai governor</u>: Fouad Aziz Ghali
1980s-2002 CE (SEAM, 2003-2004)	<ul style="list-style-type: none"> - <u>Sinai Development Authority</u>: 34,300,000EGP/St. Catherine's council = 3.5% of South Sinai investments
1980s CE (Hobbs, 1995) (Shams, 2010a, 2010b,	<ul style="list-style-type: none"> - <u>Environmental threat</u>: cable cars debate 'teleferic' on Mount Sinai

Sacred landscape

2011b, 2011c, 2011d, 2011e, 2011f,
2012a, 2012b, 2012c)

- Stakeholders 'major': local communities; governorate (i.e. Quarry Department, License Administration, Environmental Affairs Administration, Health Services Directorate and Veterinary Directorate); city council; the Holy Monastery of St. Catherine; South Sinai Development and Urbanization Agency 'Ministry of Housing and New Communities'; Egyptian General Authority for Mineral Resources 'Ministry of Petroleum'; Military Intelligence and Border Guards 'Ministry of Defense'; Tourism Police 'Ministry of Interior/Ministry of Tourism'; Ministry of Agriculture; Antiquities Department of the Supreme Council for Antiquities 'Ministry of Culture'; The General Organization for Roads and Bridges; South Sinai Electricity Company; Suez Canal University 'in addition to other national and foreign ones'

Early 1980s CE

(Lavie, 1991) (Shams, 2010a, 2010b,
2011b, 2011c, 2011d, 2011e, 2011f,
2012a, 2012b, 2012c)

Main economy

- Bedouin ownership for tourism business: Mountains Tours Office by Sheikh Mohamed Abul-Haym the Sheikh of the Gebaliya tribe 1961-mid 1990s CE and Sheikh Musa Awad Hassan

- Administration: Gebaliya tourist guides-cameleers circulation system in the High Mountains of Sinai Peninsula; G. Musa's Bedouin tourist guides-cameleers circulation system; an approximate no. of 200 Sinaitic sheikhs were appointed by the Egyptian government

1980 CE

(Dames & Moore 'USAID', 1979-
1985)

- Agriculture: reclamation policy was announced for South Sinai

Human Occupation Development

1981 CE
(Dames & Moore 'USAID', 1979-1985)

Main economy

- Tourism: 200 visitor/day are allowed inside the holy Monastery of St. Catherine; 100 visitors arrived via Suez Canal/12 vehicles
- Tourism accommodation facility: unused 140-bed hotel 'El U'rfan'

Supportive economy

- Herding: no. of livestock is 562 sheep, 4,139 goats, 784 camels, 151 donkeys, and 14 horses?
- Administration: fuel consumption/ St. Catherine's vicinity (i.e. gasoline 200, diesel 300, kerosene 60 liters/day), 1 fuel station; 1 garage; 1 mosque, 1 church, 1 public meeting place; proposed 50 telecommunication lines
- Agriculture: suggested one feddan unit for local consumption at a capital cost of 101,000US\$ and an operating cost of 50,865US\$/year (i.e. 1/8 office area, storage, processing, mechanical equipment...etc.; polystyrene cover; cooling and humidification system; irrigation via a water well of yield 3m³/day/feddan; electric supply)
- Military service: first regular call of Bedouins for the Egyptian military service
- Education: 12 rooms/3 schools (i.e. 17 girls, 145 boys, 11 teacher and 6 other employees)
- Environmental threat: leopards might still exists; required environmental impact assessment for the planned tourism facilities
- Hospital: 11 beds/1 hospital, health unit; 2 physicians/surgeons, 1 dentists
- Housing: concentration policy, no. of dwellings 600, guest houses 20

Sacred landscape

- Population: estimate of 2000 individuals in the vicinity of the town of Katharina
- Water: 2 water wells and 6 faucets; consumption of 50m³/day; irrigation estimate of 50m³/day; capacity of storage facilities 250m³

**Proposed Projects by Sinai
Development Study
'The Egyptian Ministry of
Development'
Dames and Moore '3,421,000US\$'
United States Agency for
International Development 'USAID'**

20 years project portfolio

- Drilling Program for Hydro-geological Investigations 'including St. Catherine' (no. 1)
- Visitor Facilities (no. 9)
- Network of Meteorological Stations on Sinai 'including G. Katharina' (no. 32)
- Interfaith Peace Memorial Complex 'supported priority by the former Egyptian president Anwar Sadat' (no. 36)
- Telecommunications Network 'including St. Catherine' (no. 46)
- W. Feiran Road 'Cairo - St. Catherine' (no. 60)
- Hotel and Food Service Improvements 'priority' (no. 74)
- Air Service Analysis 'including St. Catherine' (no. 84)
- Land Reclamation (no. 95)
- Master Plan, St. Catherine (no. 102)
- Fresh Water Well for 20,000 'established by the governor' (no. 103)
- St. Catherine's Museum (no. 133)
- St. Catherine's Bus Parking and Restroom Facilities 'W. El Dier, St.

Human Occupation Development

1982 CE

(Dames & Moore 'USAID', 1979-1985) (UNDP, 2002) (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)

1982-1989 CE (Lavie, 1991)

1983 CE

(Dames & Moore 'USAID', 1979-1985) (Rabinowitz, 1985) (Perevolotsky et al., 1989) (Lavie, 1991) (Hobbs, 1995) (Hobbs, 1998) (Marx, 1999) (Marx, 2003) (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)

- Catherine Monastery' (no. 134)
- St. Catherine's Hostels and Visitors Accommodations (no. 135)
- Mammals Inventory (no. 148)
- Initial Environmental Examination (no. 169)
- Controlled Environment Agriculture (no. 173)

Supportive economy (rise)

- Herdin: 18,850 heads 'livestock' in the northern half of the High Mountains of Sinai Peninsula
- Population: 3,269 individuals (i.e. 1,775 males and 1,494 females) in the vicinity of the town of Katharina 'government'; 3,500 by 'Dames and Moore'
- Transportation: first bus between St. Catherine and Cairo; W. Feiran asphalt road
- Electricity: required 900kw x2 and 150kw x2 generators of a cost 1,050,000EGP

- Environmental threat: the long drought period

Post Camp David Peace Treaty economical transition for the Gebaliya tribe due to military- political actions 'Camp David Peace Treaty'

Main economy (decline)

- Tourism: Eco-cultural tourism in the High Mountains of Sinai Peninsula
- Wage labor: oilfields, civilian-military construction, mechanics and tourism

Supportive economy (rise)

- Mountainous agriculture: local consumption (rise)
- Herdin: local consumption; sheep

Sacred landscape

- and goat; meat and milk (rise)
- Charcoal: local consumption (limited)
- Hunting (limited-prohibited)

Illegal economy (rise)

- Smuggling: the activities back in action (prohibited)

- Administration: Egyptian security-based policy; the monastery's partial loss of influence on land

- Law: civilian law is used to regulate the relation between the government and the Bedouins more than being used between the Bedouins of the same or different tribe(s)

- Ownership of land: the entire Sinai Peninsula is a national land owned by the state 'law no. 104'

16th of March 1983 - 12th of July 1986
CE
(SEAM, 2003-2004)

- South Sinai governor: Magdi Ahmed Soliman

Sinai Development Study *'The Egyptian Ministry of* *Development'*

Dames and Moore '3,421,000US\$'
United States Agency for
International Development 'USAID'

Main economy

- Tourism: town of Katharina mainly serves foreign tourism; tourism will be the leading economical activity, recommended strategy by Dames and Moore by 2000 CE; consider land use for tourism facilities; 1-3 nights tourism market share 'the vicinity of St. Catherine'

- Tourism accommodation facility: relative availability of tourism services

1985 CE

(Dames & Moore 'USAID', 1979-1985) (Rabinowitz, 1985) (Perevolotsky et al., 1989) (Lavie, 1991) (Hobbs, 1995) (Hobbs, 1998) (Marx, 1999) (Marx, 2003) (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)

Human Occupation Development

Supportive economy

- Mountainous agriculture: food production 'support'
- Herding: the High Mountains of Sinai Peninsula as a grazing vicinity
- Handicrafts: support (Fig. 29)

Illegal economy

- Smuggling
- Administration: the town of Katharina has chief executive but no staff; 4 generator of 300kw capacity/200 households, daily consumption is 1,400kwh; required telecommunication lines
- Airport: required development of 'El U'rfan' with an estimate of 340,000EGP of 3.5% sectoral share
- Environmental threat: St. Catherine conservation priority under consideration as a national park; evapotranspiration model
- Jobs: total estimate of 220 by 1991-1992 CE
- Population: estimated population by 2000 CE is less than 5,000; Bedouin population 80-95%, uplands' Bedouin population 97%; foreigners exist for religious purposes
- Transportation: importance of the establishment of St. Catherine-Nuweiba' road

Note: availability of a general store with a staff of 3 individuals

- Administration: Katharina City Council, post and telecommunication office, Cairo Bank, market, mosque, youth club, two fuel stations, fire station, road checkpoint, monastery checkpoint, tourism police, police station, military and intelligence office, central generator

(Shams, 2010a, 2010b, 2011b, 2011c,
2011d, 2011e, 2011f, 2012a, 2012b,
2012c)

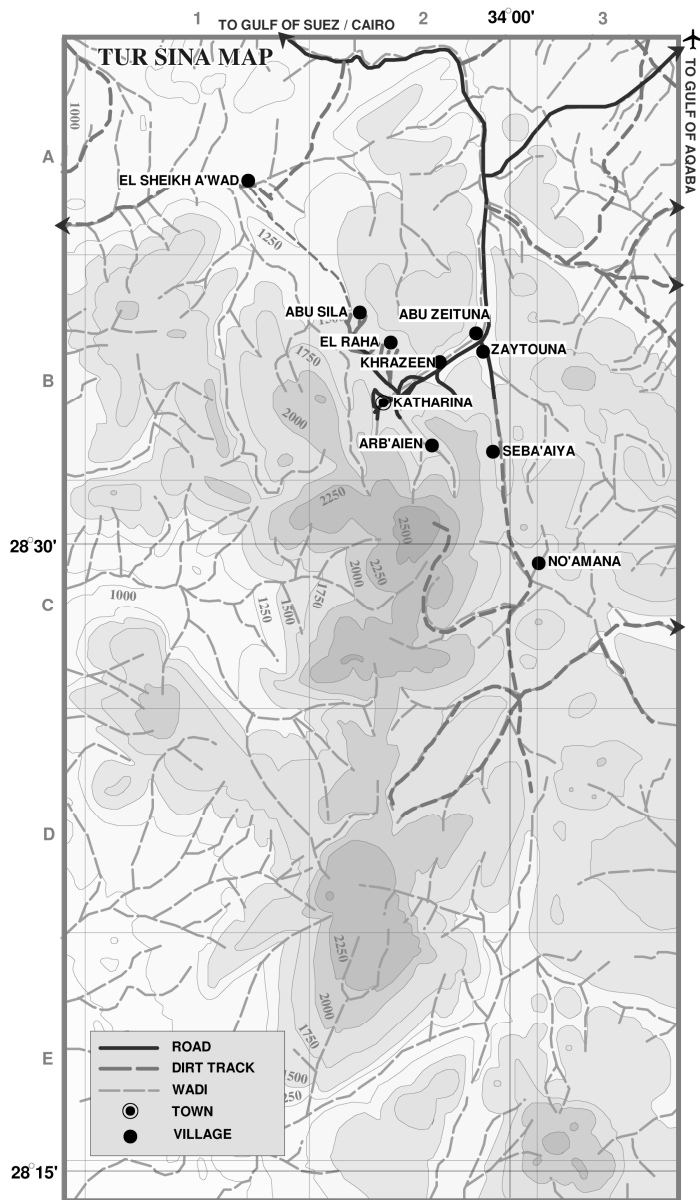


Figure 24 Towns-villages 'urban-rural'; High Mountains of Sinai Peninsula (base map: War Office and Air Ministry 1956/US Army Map Service 1952, 1:250 000): Sinai Peninsula Research 2000-2010 CE



(a - 1911 CE)



(b - 1977 CE)

Figure 25 El Melga Plain 'current location of the town of St. Catherine - urban center' from G. Abbas Basha 2304m ASL: (a) by American Colony of Jerusalem on 23rd of March 1911 CE; (b) by Kiliweb 1977 CE



(a - 1898-1914 CE)



(b - 2009 CE)

Figure 26 El Melga Plain 'current location of the town of St. Catherine - urban center': (a) by American Colony of Jerusalem 1550m ASL in 1898-1914 CE; (b) by Sinai Peninsula Research '2000-2010' 1570m ASL in 2009 CE

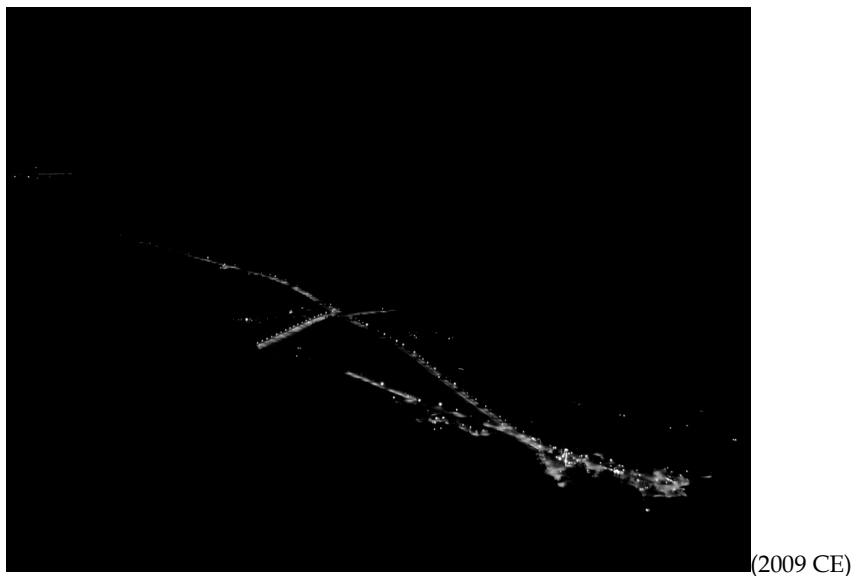
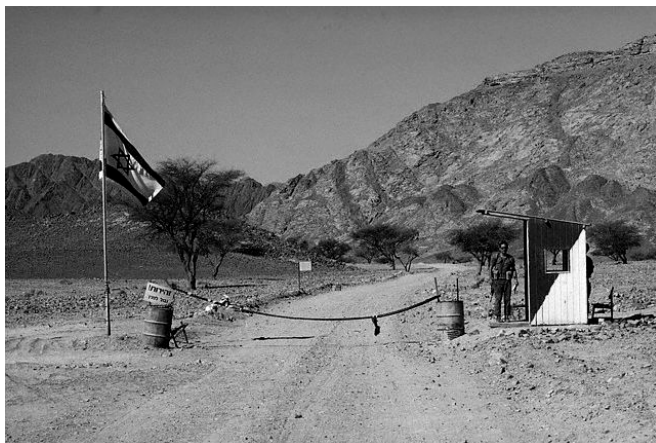


Figure 27 El Melga Plain 'current location of the town of St. Catherine - urban center' from G. Abbas Basha 2304m ASL on 19th of June 2009 CE: Sinai Peninsula Research 2000-2010 CE



(a - 1975-1979 CE)



(b - 1979 CE)

Figure 28 (a) Temporary disengagement line between the Arab Republic of Egypt and the State of Israel 'probably at W. Feiran' in 1975-1979 CE: Alain Le Garsmeur; (b) Former Egyptian President Mohamed Anwar El Sadat 'fourth sitting from the left' and Vice President Mohamed Hosni Mubarak 'third sitting from the left - former President' praying at El Raha Plain 1520-1570m ASL upon raising the Egyptian flag on the High Mountains of Sinai Peninsula 'the vicinity of the Holy Monastery of St. Catherine - Tur Sina' on 19th November 1979 CE: William Karel



(a - 1912 CE)



(b - 1981 CE)

Figure 29 Bedouin woman weaving cloth 'handicrafts - Sinai Peninsula': (a) by Underwood & Underwood on 10th of January 1912 CE; (b) by David Eisenberg in 1981 CE

Sacred landscape

<p style="text-align: center;">1986 CE (UNDP, 2002)</p>	<ul style="list-style-type: none"> - <u>Scientific research infrastructure</u>: Suez Canal University Research Center 'former Tzukei David Field Study Center' - <u>Population</u>: vicinity of the town of Katharina (i.e. rural = 3,363; urban = 347; total = 3,016) or (i.e. rural = 3,014; urban = 359; total = 3,373)
<p style="text-align: center;">13th of July 1986 - 19th of August 1991 CE (SEAM, 2003-2004)</p>	<ul style="list-style-type: none"> - <u>South Sinai governor</u>: Mohamed Nour El Din Afifi
<p style="text-align: center;">1988 CE (ICOMOS, 2002) (PAMU, 2003) (UNESCO, 2008)</p>	<ul style="list-style-type: none"> - <u>Natural reserve</u>: St. Catherine Natural Protectorate was declared under Law 102/1983, by Prime Minister's Decree no. 613
<p style="text-align: center;">1989 CE (ICOMOS, 2002) (PAMU, 2003) (UNESCO, 2008)</p>	<ul style="list-style-type: none"> - <u>Natural reserve</u>: alteration of the administrative structure of St. Catherine Natural Protectorate by Prime Minister's Decree no. 30?
<p style="text-align: center;">Late 1980s-2000s CE (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)</p>	<p style="text-align: center;"><u>Establishment of Tourism accommodation facilities</u></p> <ul style="list-style-type: none"> - W. El Dier Hotel - St. Catherine Tourist Village - Fairuz Hotel 'former El Raha Tourists Camp' - Catherine Plaza Hotel - El Wady El Mouqudess Hotel - Daniella Village - Morgenland Village - El Melga Bedouin Camp 'Bedouin ownership' - Fox Camp 'Bedouin ownership' - Moon Camp 'Bedouin ownership' - El Karm Ecolodge - Sheikh Sina Ecolodge
<p style="text-align: center;">20th of August 1991 - 28th of November 1993 CE (SEAM, 2003-2004)</p>	<ul style="list-style-type: none"> - <u>South Sinai governor</u>: Abdel Moneim Mohamed said

Human Occupation Development

<p>1992 CE (PAMU, 2003)</p>	<p><i>Main economy</i> - <u>Tourism</u>: 29,000 visitors to G. Musa</p>
<p>1993 CE (PAMU, 2003) (http://www.makhad.org/)</p>	<p>- <u>NGO</u>: Makhad Trust - <u>Population</u>: 75% Bedouin population in St. Catherine Natural Protectorate</p>
<p>29th of November 1993 - 8th of July 1997 CE (SEAM, 2003-2004)</p>	<p>- <u>South Sinai governor</u>: Mamdouh El Zohairy</p>
<p>1994 CE (UNDP, 2002) (ICOMOS, 2002) (PAMU, 2003) (UNESCO, 2008)</p>	<p>- <u>Population</u>: 4,603 individuals in vicinity of the town of Katharina</p>
<p>1995 CE (UNDP, 2002) (ICOMOS, 2002) (PAMU, 2003) (UNESCO, 2008) (SEAM, 2003-2004) (SSRDP, 2006b)</p>	<p><i>Main economy</i> - <u>Mass tourism</u>: Regional Economic Development Working Group (REDWG), European Union-sponsored tourism-development scheme TEAM 'Taba-Eilat-Aqaba Macro area'; average number of visitors 100,000 to 150,000/year</p>
<p>1996 CE (UNDP, 2002) (ICOMOS, 2002) (PAMU, 2003) (UNESCO, 2008) (SEAM, 2003-2004) (SSRDP, 2006b) (http://www.saintcatherinefoundation.org/)</p>	<p><i>Main economy</i> - <u>Tourism accommodation facility</u>: 932 bed capacity/hotels; 360 bed capacity/camps; average occupancy 19.7%</p>
	<p>- <u>Natural reserve</u>: Actual establishment of St. Catherine Natural Protectorate, boundaries identification of 4,350km² under an EU Commission fund (i.e. initial phase '1996-2001' 1,200,000 €; second phase 6,000,000 €, in addition to 1,750,000 € by Egyptian government; strategic plan 30,000,000 €) 'Prime Minister's Decree no. 940'; El Karm Ecological; Visitors Center; required staff 85 individuals '20/1,000km²'; 2 industrial zones, 100km² each 'Egypt's National Development Plan' (Fig. 30 & 31) - <u>NGO</u>: Saint Catherine Foundation</p>

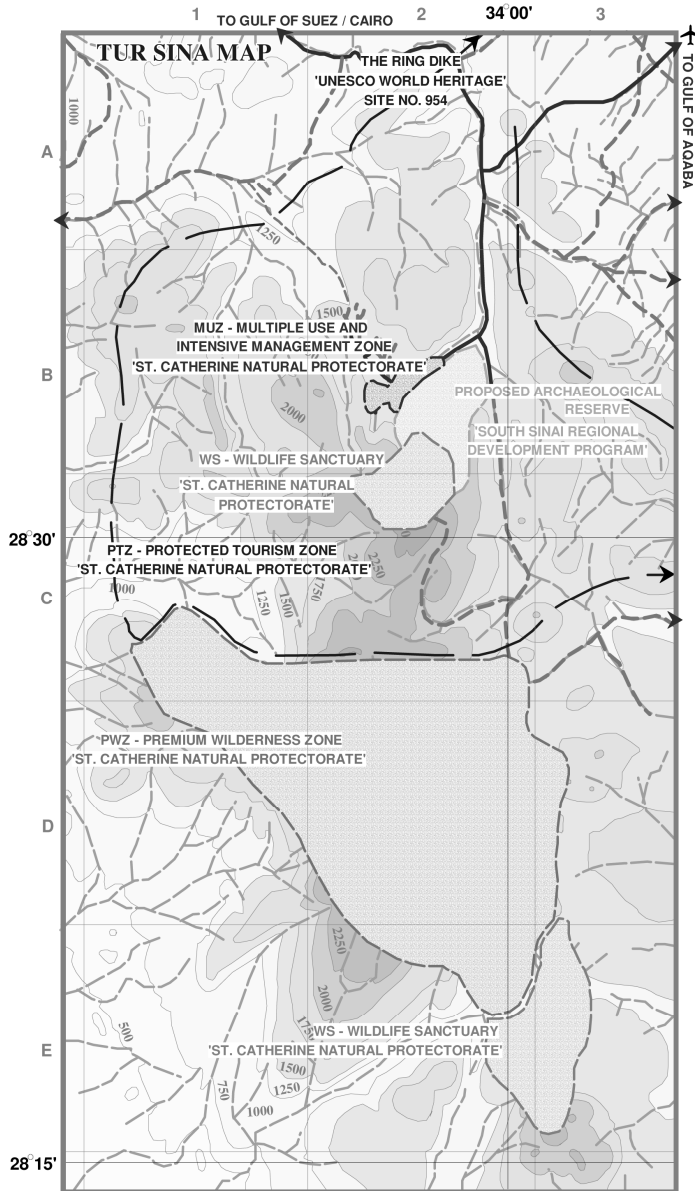


Figure 30 Management zones; High Mountains of Sinai Peninsula (base map: War Office and Air Ministry 1956/US Army Map Service 1952, 1:250 000); Sinai Peninsula Research 2000-2010 CE



(a - 2009 CE)



(b - 2009 CE)

Figure 31 (a) Stone road sign of St. Catherine Natural Protectorate at Watiya Pass 1200-1250m ASL on 10th of June 2009 CE; (b) Visitors center of St. Catherine Natural Protectorate at W. El Dier 'Holy Valley Tuwa' 1520m ASL on 10th of June 2009 CE: Sinai Peninsula Research 2000-2010 CE

Sacred landscape

1997- ---- CE
(SEAM, 2003-2004)

- Population: urban (i.e. 554 males and 200 females, 110 families); rural (i.e. 1812 males, 1652 females, 780 families); rural = 3,465, urban = 754, total = 4,219 in the vicinity of the town of Katharina; 7,000 Bedouins in St. Catherine Natural Protectorate; 1900 individuals/200 feddans?
- Wildlife: leopard of Naqb Protectorate

1998 CE
(UNDP, 2002) (ICOMOS, 2002)
(PAMU, 2003) (UNESCO, 2008)
(SEAM, 2003-2004)

- South Sinai governor: Mustafa Afifi
- Egyptian Ministry of Culture: consideration of the vicinity of St. Catherine as a future World Heritage Site
- Population: 2500 inhabitants in the town of Katharina; vicinity of the town of Katharina (i.e. rural = 3,563; urban = 875; total = 4,438)
- Urban plan: sustainable plan for the town of Katharina
- Water: demand of 794m³/day (210m³/day/rural; 428m³/day/urban; 151m³/day/other; 5m³/day/losses); pumping 385m³/day 'shortage'; average of 1088 tourists consume 544m³/day; deficit in supply -409m³/day/residents and -554m³/day/commercial

1999 CE
(UNDP, 2002) (ICOMOS, 2002)
(PAMU, 2003) (UNESCO, 2008)
(SEAM, 2003-2004)

- Main economy*
- Mass tourism: 300,000 visitors to G. Musa
- United Nations Development Programme 'UNDP' and Global Environmental Facility 'GEF': proposal for the conservation of the medicinal plants

Late 1990s- Early 2000s CE
(Marx, 1999) (Marx, 2003) (Shezaf, 2004) (Shams, 2010a, 2010b, 2011b,

Egyptian Economical Reform
'Privatization'!

Human Occupation Development

2011c, 2011d, 2011e, 2011f, 2012a,
2012b, 2012c)

Main economy (significant rise)

- Mass tourism: Eco-cultural tourism in the High Mountains of Sinai Peninsula
- Wage labor: tourism services and natural-cultural resources conservation

Supportive economy (decline)

- Mountainous agriculture: local consumption; 20 families worked a number of orchards (decline)
- Herding: local consumption; sheep and goat; meat and milk (decline)
- Charcoal: local consumption (limited by law)
- Hunting (prohibited)

Illegal economy (relatively considerable)

- Smuggling (prohibited)

Late 1990s-2010 CE

(UNDP, 2002) (ICOMOS, 2002)
(PAMU, 2003)
(UNESCO, 2008) (SEAM, 2003-2004)
(Shams, 2010a, 2010b, 2011b, 2011c,
2011d, 2011e, 2011f, 2012a, 2012b,
2012c)

- Environmental threat: the long drought period
- Water: 7km network partially complete

2000s CE

(UNDP, 2002) (ICOMOS, 2002)
(PAMU, 2003) (UNESCO, 2008)
(SEAM, 2003-2004) (SSRDP, 2006b)
(Shams, 2010a, 2010b, 2011b, 2011c,
2011d, 2011e, 2011f, 2012a, 2012b,
2012c)

Main economy

- Mass tourism: average 700-1000/day, max. 3000 visitors to G. Musa per day
- Education: a Bedouin generation of bachelor degrees

Main economy

- Value of St. Catherine Natural Protectorate: excursions sold by local tour operators = 15,000,000US\$
- Tourism accommodation facility: 1,414 bed capacity/hotels; 256 bed capacity/camps; average occupancy 17%

2000 CE

(UNDP, 2002) (ICOMOS, 2002)
(PAMU, 2003) (UNESCO, 2008)
(SEAM, 2003-2004) (SSRDP, 2006b)

Sacred landscape

2001 CE
(UNDP, 2002) (ICOMOS, 2002)
(PAMU, 2003) (UNESCO, 2008)
(SEAM, 2003-2004) (SSRDP, 2006b)

2002 CE
(UNDP, 2002) (ICOMOS, 2002)
(PAMU, 2003) (UNESCO, 2008)

- Airport: 842 passengers/78 flights
'El U'rfan'

- Airport: 1,627 passengers/80 flights
'El U'rfan'

- Migration: 600 individuals from the Nile Valley to the town of Katharina 'unstable/high turnover population'

- Natural reserve: staff of 12 Rangers, 25 Community Guards 'Gebaliya Bedouins', 2 secretaries, 5 drivers, and 5 assistants (i.e. stone tablet makers, guides...etc.)

- Water: W. Feiran supportive source for the town of Katharina

Main economy

- Mass tourism: 300,000 visitors to G. Musa; 10.1% rooms occupancies

Supportive economy

- Herding: average of 12 goats and sheep/household? Total number of livestock in the northern half of the High Mountains of Sinai Peninsula = 14,500 heads

- Administration: vegetation agreement in action 'Hilf'

- Electricity: 4 generators; capacity 1.3mw; consumption 0.7mw (≈)

- Environmental threat: vegetation loss in St. Catherine Natural Protectorate (i.e. 512 → 316 species); loss of vegetation around localities

- United Nations Educational, Scientific and Cultural Organization 'UNESCO': the northern half of the High Mountains of Sinai Peninsula is declared as the World Heritage Site no.954 (i.e. surface area is 595.87-641km²)

- United Nations Development Programme 'UNDP': Medicinal Plants Project (i.e.

8,882,998US\$)

- Administration: tribal call for the reformation of the Gebaliya tourist guides-cameleers circulation system in the High Mountains of Sinai Peninsula to be converted into parallel territorial clan-based system

Recommendations/facts by the
Support for Environmental
Assessment and Management
Programme 'SEAM'

Egyptian Environmental Affairs
Agency'

UK Department for International
Development

Main economy

- Mass Tourism: no. of tourists increases; religious/eco-cultural tourism activities; handicrafts industry; ecolodges; 305,000 visitors on G. Musa = 28% share of South Sinai tourists; required visitors management plan for the monastery and development of alternative destinations

- Tourism accommodation facility: no. of rooms 775 in the town of Katharina (i.e. 236 beds/118 rooms/1 four stars hotel; 1016 beds/490 rooms/4 three stars hotel; 700 beds/167 rooms/7 unclassified; total = 1,952 beds/775 rooms/12 facilities; to be increased to 2,980 as a first stage); 4 stars hotel and swimming pools at a desert environment

Supportive economy

- Herding: local consumption; 4-8 sheep and 5-10 goats per household; meat and milk (decline)
- Agriculture: El Melga Plain water

2003-2004 CE

(SEAM, 2003-2004) (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)

Sacred landscape

collector/reservoir of 50m³ capacity;
plant nurseries managed by Bedouins;
Acacia Rehabilitation Programmes;
cultivation of woody species using
waste water

- Education: priority of technical schools

- Electricity: constant supply to all rural-urban areas

- Environmental threat 'proposal': asphalt roads 'Tur - W. Hibran - W. Sulaf - Naqb Hawa - Raha Plain!'; alien plants; streetlights; licensing medicinal plants collection

- Housing: design and material 'natural-cultural relevance'; 96 contracted public housing units, 226 governmental units and 500 Bedouin units in the town of Katharina; Urban Management Technical Unit and building codes

- Hospital: improvement of St. Catherine Hospital; emergency units on the roads to the High Mountains of Sinai Peninsula

- Jobs: tourism; Gebaliya Bedouins are skilled construction workers; 4 workshops; staff of St. Catherine Natural Protectorate = 70

- Migration: limited outside migration; equality in jobs between Bedouins and Nile Valley 'education matter'; population decrease in the rural villages of St. Catherine's Protectorate

- Monasticism: (150?) property of Holy Monastery of St. Catherine in the vicinity of St. Catherine's Natural Protectorate

- NGO: across South Sinai, 5% operate in St. Catherine's council

- Population: 4,880 individuals in the vicinity of the town of Katharina

- Revenue: 5EGP/Egyptian visitor

and 5US\$/foreign visitor ticket '24 h' of St. Catherine Natural Protectorate directed towards Environmental Protection Fund 'EPF', 40% should be refunded to the protectorate; 25,646EGP from solid waste

- Scientific research infrastructure: two meteorological units 'St. Catherine Protectorate head office and G. Katharina'

- Transportation: lack of transportation between rural-urban settlements; tourists arrival by coaches 74%, minibuses 11%, and car/taxi 15%

- Waste: required investment of 4,300,000EGP (i.e. Purchase 2 scavenging trucks + 2 trailers; completion of sewage network; 18 sewers; wastewater treatment plant); 19 septic → vacuum tanks; 2 gravity sewers; introduce decentralized rural-urban sewage systems 'Tarfat El Qidarein'; solid waste management (i.e. availability of sorting station 3km from the town and 20,000km² landfill site 22km from the town; 3 tipping trucks; 1 loader; 2 tractor-loader; 60 x 0.2 bins; 50+ containers; labor force 26); 15m³/day/residents + 25-30m³/day/commercial ≡ 5-7 tons of solid waste/day/residents-commercial at a management cost of 63,200EGP/year and strategic cost of 2,228,000EGP/next 4 years); waste density 100-150kg/m³; possibility of recycling sum of 1,000EGP/day ≡ 1-1.2 tons/day out of 2.2 commercial waste 'G. Musa and accommodation facilities'

- Water: required investment of 23,000,000EGP/5 years = 14.7% of South Sinai water investments (i.e. 37 km of water network; 3 booster

Sacred landscape

	stations; 3 ground tanks; dams; 3 water trucks; 4 new water wells in the buffer zone); required waterline; 130 water wells in St. Catherine's council 'shortage'; designed capacity = 720m ³ /day, actual capacity = 500m ³ /day 'town of Katharina government's water well' (i.e. urban public demand = 410m ³ /day/council; urban private demand = 461m ³ /day/council; rural public demand = 618m ³ /day/council; total demand = 1,489m ³ /day); main water wells 135m ³ /day/2 public wells and 65m ³ /day/1 private well; 1 booster station
January 2003 - January 2008 CE (PAMU, 2003)	- <u>Natural reserve</u> : operational period for St. Catherine's Natural Protectorate management plan
----- (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)	- <u>South Sinai governor</u> : Mohamed Hany Metwally
2005 CE (SEAM, 2003-2004)	- <u>Waste</u> : 2 collection vehicles and 1 tractor-loader for dumpsite - <u>National economical policy</u> : reinforcement of privatization in the High Mountains of Sinai Peninsula - <u>NGO</u> : Community Foundation for South Sinai
2006 CE (SSRDP 2006-2010) (Hobbs, 1995) (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c) (http://www.fansina.net/) (http://www.sheikhsina.com/) (http://www.eeca.net/) (http://www.saintkatherinecenter.org/) (http://www.lamans.gr/) (www.southsinaifoundation.org/)	<u>European Commission SSRDP 'South Sinai Regional Development Program' (64,000,000 €)</u> <i>The High Mountains' Projects</i> - FanSina (Selema Gabaly) - Sheikh Sina (Sheik Musa's and Farag Fox families); Ecolodge of W. Sebaa'iya - Egyptian Earth Construction

Human Occupation Development

	<p>Association 'EECA'</p> <ul style="list-style-type: none"> - Community and Environmental Services Association (CESA) - The Holy Monastery of St. Catherine - Bedouin Cultural Center 'Ethnographic Museum' - Medicinal Plants (Ahmed Mansur)? - Bedouin Mechanic at Tarfat El Qidarein? - Jebel Mousa Association? - Jebeliya NGO? - Solar Cells Distribution Project? 'South Sinai' - Medical Convoy? 'South Sinai' - St. Catherine Waterline (i.e. 4,000m³ for the town of Katharina and W. Feiran)
<p>2007 CE (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)</p>	<ul style="list-style-type: none"> - <u>Ownership of land</u>: Egyptians 99 years Usufruct Right (Leasehold) in Sinai Peninsula
<p>2008 CE (UNDP, 2002) (http://www.mpcpegypt.com/)</p>	<ul style="list-style-type: none"> - <u>NGO</u>: the Medicinal Plants Association
<p>2009 CE (SEAM, 2003-2004)</p>	<ul style="list-style-type: none"> - <u>Waste</u>: 12-14 tons of waste/day/residents - <u>Broadcast</u>: satellite channels Vs radio channels
	<p><i>Main economy</i></p> <ul style="list-style-type: none"> - Tourism: 450,000 tourists on G. Musa?
<p>2010 CE (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)</p>	<p><i>Supportive economy</i></p> <ul style="list-style-type: none"> - <u>Mountainous agriculture</u>: 623 orchards and 351 agricultural plots in the High Mountains of Sinai Peninsula - <u>Environmental threat 'proposal revival'</u>: asphalt roads 'Tur - W. Hibran - W. Sulaf - Naqb Hawa - Raha Plain' - <u>Housing</u>: 1,459 households in St.

Sacred landscape

Catherine's vicinity/council?

- South Sinai governor: Mohamed Abdulfadeel Shosha

Post European Commission SSRDP 'South Sinai Regional Development Program'

Main economical activity:

- Eco-cultural tourism*
- Tourism services and natural-cultural resources conservation

Rising supportive-economical activity:

- Medicinal plants**
- Handicrafts***

Traditional supportive-economical activity:

- Mountainous agriculture****(i.e. constant at low level)
- Herding (i.e. constant at low level)
- Charcoal production (i.e. very limited)

Extinct traditional supportive-economical activity:

- Hunting (prohibited by law)

Illegal supportive economical activity:

- Smuggling (prohibited by law)

- South Sinai governor: Khaled Fuda

The Egyptian National Reforms Revolution of January 25, 2011 CE

Main economical activity (partial decline 33-40%):

- Eco-cultural tourism*
- Tourism services and natural-cultural resources conservation

Rising supportive-economical activity (decline):

- Medicinal plants** (Fig. 32)
- Handicrafts***

Traditional supportive-economical activity (constant):

- Mountainous agriculture****(i.e.

2011 CE

(Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)

Human Occupation Development

2011-2012 CE
(Al Tebiyan Magazine,
March 15, October 2, 2012)

2012 CE
(El Shrouk Newspaper,
October 30, 2012)

2017 CE
(SEAM, 2003-2004) (SSRDP, 2006b)

- constant at low level)
- Herding (i.e. constant at low level)
- Charcoal production (i.e. very limited)

Extinct traditional supportive-economical activity (constant):

- Hunting (prohibited by law)

Illegal supportive economical activity (rise):

- Smuggling (prohibited by law)

- Distribution of subsidized goods 'decentralized distribution':

El Gam'aiya El Shr'aiya 'Islamic NGO' first ever relief convoys to the remote rural and urban areas of southwest Sinai '16 tons food supplies, 250kg meat, 500 blankets, and 1300 traditional dresses in June 2011, and January/September 2012; in addition to medical, educational, and other social services *D'awa*

- Airport: reoperation of El U'rfan 'St. Catherine Airport', receiving the flights of Bright Star Co. after an unspecified closure period in support of the declining eco-cultural tourism; capacity of 80 passengers/hour/daylight operation, 3 small aircrafts/1 tarmacadam '240x60m', and 40 PCN runway '2115x36m'

National Development Plan Prior the Egyptian National Reforms Revolution of January 25, 2011 CE

Main economy

- Tourism accommodation facility: no. of rooms 5679

- Housing: estimate of 1,660 households in St. Catherine's vicinity/council?

- Jobs: agriculture 6.2%; industry 2%,

Sacred landscape

<p>2020 CE (SEAM, 2003-2004)</p>	<p>power and utilities 3%; mining 0.7%; construction 8.1%; administration 20%; travel and tourism services 60% 'additional 400 jobs in tourism and another 480 in other fields'</p> <ul style="list-style-type: none"> - <u>Migration</u>: estimate of 10,000 Nile Valley people - <u>Population</u>: estimate of 17,378 individuals in the vicinity of the town of Katharina (i.e. only 35% Bedouins); 6,000 individuals/360 feddans? - <u>Water</u>: 130 water wells in St. Catherine's council 'shortage' = 1500m³/day (i.e. urban public demand = 774m³/day/council; urban private demand = 1,413m³/day/council; rural public demand = 696m³/day/council; total demand = 2,883m³/day/council) - <u>Waste</u>: 20-25 tons of waste/day/residents - <u>Population</u>: estimate of 20,000 individuals in the vicinity of the town of Katharina¹
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¹ Notes

Population: there is no solid population data for the High Mountains of Sinai Peninsula (i.e. approximate figures)

Waste: density (i.e. 275 kg/m³/residents and 225 kg/m³/commercial); quantity (i.e. 4 kg/room/day or 2.1 kg/bed/day; 1.2 kg/person/day)

* UNESCO 'World Heritage Site No. 954' and EU Commission 'St. Catherine Natural Protectorate' (2000)

** (UNDP, 2001)

*** EU Commission 'St. Catherine Natural Protectorate' (PAMU, 2003)

**** Makhad Trust (Makhad, 2012)

2.2 The treasures of the holy monastery of St. Catherine at Mount Sinai: from the treasury of 6th century CE to the museum of 21st century CE ‘the High Mountains of Sinai Peninsula’

Over 1400 years of continuous inhabitation for Justinian’s fortress in Sinai Peninsula which was built in 530-545 CE, the Holy Monastery of St. Catherine at Mount Sinai (Fig. 33) houses a collection of 3,307 multilingual manuscripts (i.e. the world’s second largest collection of Greek manuscripts after the Library of the Vatican), 7,000 copies of old prints and 2,048 icons; other than the sacred vessels, vestments and jewelry. Owing to several potential factors (i.e. holiness of the site for Judaism, Christianity and Islam; royal trustees of protection; fortification; geographical remoteness; and environmental setting), the works of art survived through history, providing the scholars an outstanding material for scientific research, a living landmark of Byzantium. From the treasury of 6th century CE, via the early catalogues of mid-late 19th century CE and the transfer of the possession of Codex Sinaiticus in the 2nd half of 19th century CE to Alexander II (1818-1881 CE) the Czar of Russia (i.e. Old Testament and the world’s oldest complete copy of the New Testament, dated back to mid 4th century CE), until the need to display the works of art in the 21st century CE inside a Museum (2001 CE); this section discusses the historical rise of a sacred landscape and how the perspective towards the collection was developing through history in terms of functionality, study and display; being influenced by religious, scientific, geo-political and economical factors.

2.2.1 Introduction

Since the monastic book of the ‘Ladder of Divine Ascent’, written by the Syrian-born Sinaitic monk St. John Climacus (March 30, 525-606 CE), also known as John of the Ladder, John Scholasticus and John Sinaites who joined the monastic life by the age of sixteen, and he was selected as the abbot of Mount Sinai in 600 CE (Catholic Encyclopedia Reports, 1909); there is no doubt that the movable-immovable collection of the works of art of the Holy Monastery of St. Catherine is being accumulated over 1450 years of existence (545-21st century CE). The immovable works of art are mainly represented in mosaics, frescos, marble floors, engraved wooden doors, icon-stands and platforms, which

are housed inside the main buildings of the monastery (i.e. basilica, chapels, chapter-house, refractory, library-scriptorium, monastic cells...etc.) (Attia, 1952) (Fig. 34). On the other hand, the movable works of art are mainly represented in the manuscripts, old prints, icons, sacred vessels, vestments, jewelry, crosses, candlesticks and bells (Fig. 35). Actually, the collection of the monastery is a mixture between the works of art of a Sinaitic origin (i.e. created by the Sinaitic monks using local and/or imported material); ones were reused by the Sinaitic monks; ones were gifted by emperors, kings, czars and sultans; ones were hidden inside Justinian's fortress for protection during periods of mono-religious-political tensions (i.e. tensions between sects) due to its fortification and geographical remoteness, as such works of art ended up as a part of the collection; and others were taken away from the monastery under mono-religious-political influence. Among the most significant works of art in terms of artistic value, age and number are the manuscripts, old prints, icons and the Transfiguration Mosaic of Mount Sinai.

Currently, there are 3,307 manuscripts in the library; two third of those are Greek manuscripts and the rest of them are Arabic/Arabic-Islamic, Coptic, Iberian (Georgian), Armenian, Ethiopian and Syrian (Aphanglous, 1984). In addition to the manuscripts, there are 7,000 copies of old books dated to the early years of printing (i.e. the old prints are written in the same previous languages, in addition to Polish, Slavonic, Turkish, Persian and Latin) and 8,000 modern books (Attia, 1952) (Justin, 2009). Almost 2,048 icons are preserved in the monastery (Dahari, 2000). Actually, the works of art passed through three consecutive ages (i.e. Treasury Age '545-1844 CE', Catalogues Age '1844-2001 CE' and Museum Age '2001 CE-contemporary'); simultaneously with an increasing interest of pilgrims since 363 CE, travelers since 1336 CE and tourists since early 20th century CE and mass tourism since 1970s CE (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c) (Fig. 36).

2.2.2 The treasury age

According to the historical accounts, Mount Sinai 'Gebel Musa or Mosses Mountain' was identified as the Mountain of Law by Julian Saba the Syrian pilgrim in 363 CE, initiating a Christian pilgrimage tradition to the wilderness of Mount Sinai; while in 383-384 CE, Egeria

the pilgrim identified the early Sinaitic monastic settlements (i.e. Early Pilgrimage Period 'EPP' 363-545 CE) . After the construction of the monastery in 530-545 CE, the works of art 'collection' started to get accumulated within the walls of the fortress. In 1336 CE, Wilhelm Baldensel and Ludolf Von Suchem were the first Western travelers to Mount Sinai. For 800 years of Post Early Pilgrimage Period 'PEPP' (545-1336 CE), several mono-religious-political and interreligious-political events enriched, threatened and protected the precious collection: the 200 Byzantine soldiers who were ordered by Emperor Justinian for the protection of the monastery; the trustee of Prophet Mohamed of the Muslims in 7th century CE; the Byzantine Iconoclasms in 730-787 and 814-842 CE which caused the flow of a number of icons into the monastery from Byzantium; the unexecuted violation and the trustee of the Fatimid king Hakim Be-amr Allah (996-1020 CE); the refusal of Mount Sinai monks to welcome the visit of Baldwin I the Crusader of Jerusalem in 11th century CE in order not to be counted by the Arabs as an allies of the Crusaders; and the trustee of the Fatimid king El 'Adid Li-Din Allah (1160-1171 CE) in 1169 CE (Shuqier, 1917).

During these 800 years, the works of art were increasing in the form of a treasury, being housed inside several buildings, as the movable works of art were used by the monks, and displayed for both monks and pilgrims for religious purposes. During that period, the pilgrims were the only visitors of the Holy Monastery of St. Catherine. Justinian's Basilica was the central worship place, while the Burning Bush was and still the keystone of the fortress. The manuscripts were stored in the old library-scriptorium, as several ancient codices are dated back to the Post Early Pilgrimage Period - Treasury Age, such as Codex Sinaiticus in mid 4th century CE, Syrian Codex or Codex Syriacus in 400 CE (i.e. it was rewritten in 7th-8th centuries CE), St. Mark's Gospel in 6th century CE, the text of John Climacus in 7th century CE, the Golden Greek Gospel of the Byzantine Emperor Theodosius III in 717 CE, a copy of Homer's Iliad in 8th-9th centuries CE and Codex Arabicus in 9th century CE (Attia, 1952).

Actually, twenty Four of the icons are Byzantine, produced at Constantinople in 5th-6th centuries CE, and Seventeen other were produced in the Levant in 6th-7th centuries CE (Dahari, 2000); another group in 6th-10th centuries CE and the majority are dated back to 11th-15th centuries CE. The icons were drawn according to different art styles: Greek, Georgian, Syrian, Coptic and Cretan (Aphanglous, 1984).

Sacred landscape

The main icons of Post Early Pilgrimage Period 'PEPP' are Encaustic Virgin, Ascension, and Sacrifice of Jephthah's Daughter in 6th century CE; St. Peter the Apostle, and Christ Pantocrator in 6th-7th centuries CE; Abraham Sacrificing his Son Isaac, and Nativity in 7th century CE; Miracle of Chonae in 11th-12th centuries CE; Archangel Michael, Transfiguration, Baptism, Archangel Gabriel, Presentation of Christ in the Temple, Theoptes, Great Deesis, Deesis, Raising of Lazarus, Crucifixion and Annunciation in 12th century CE; Ladder to Heaven, Archangels Michael, Theoptes, Life of Christ, Crucifixion and Gabriel in 12th-13th centuries CE; Anastasis and the Ascension, Nativity, St. Sergius and Bacchus, St. Theodosia, St. George x2, Three Saints, Christ Enthroned in Glory, Virgin and Hagiologion Calendar Icon in 13th century CE; Apostles Paul, Andrew and Peter in 13th-14th century CE (Waston, 2009).

Since 6th century CE, the apse is the most remarkable immovable work of art of the entire monastery, with its wall mosaic of the Transfiguration which dominates the whole scene inside Justinian's Basilica (Fig. 37):

The mosaic inscription yields the names of Longinus the Abbot, John the Deacon and Theodore the Dutereuon or Deuterarios, "the second in command". All were alive at the time of the mosaic's execution, but we know nothing about them (Sevcenko, 1966).

The mosaic covers an area of 46m²; it is made out of more than half a million pieces (i.e. 11,700 pieces/m²). Precious materials were used in its execution; gold/silver papers and glass paste (Nerdy et al., 2006)

In 1336 - mid 20th century CE (i.e. Travelers Period 'TP'), dozens of scholars of different scientific backgrounds were visiting the monastery, along with pilgrims. Those scholars were biblical researchers, historians, archaeologists, geographers, geologists, botanists, naturalists and artists, indicating an increasing interest in the monastery, reaching its peak in the 19th century CE. For 700 years of the Travelers Period, other trustees were granted to the monastery, for example, by the Ottoman Sultan Mustafa Khan I (1617-1618 CE) in 1618 CE; the Republic of France, Napoleon Bonaparte (1798-1804 CE) on 20th of December 1799 CE; the Republic of France, commander Dames on 1st of November 1800 CE; and the Ottoman Sultan Abd El Hamid on 23rd of December 1904 CE. Those trustees guaranteed the security of the

treasury and the flow of additional works of art to the monastery (Shuqier, 1917).

One of the significant icons of the Travelers Period are the ones of St. Catherine of 15th century CE; St. Catherine Enthroned, St. Catherine, Archangel Michael, and Virgin of the Passion in 16th century CE; Prophet Moses, Topographical Icon of Mount Sinai, and St. Catherine and her Life in 17th century CE; Monastery of St. Catherine, and Martyr St. Paraskeve in 18th century CE; in addition to other ones of St. Catherine, and St. Catherine Enthroned of unknown date (Waston, 2009). By late Travelers Period 'TP', the appearance of the German scholar Constantine von Tischendorf on the Sinaitic theatre announced the start of the Catalogues Age (1844-2001 CE).

2.2.3 The catalogues age

There is no doubt that the name of the German scholar Constantine von Tischendorf is attached to two major issues: the first serious attempt to archive and study the manuscripts of the Holy Monastery of St. Catherine; on the other hand, his name is attached to the transfer of the possession of the world's most ancient codex—Codex Sinaiticus (i.e. Old Testament and the world's oldest complete copy of the New Testament, dated back to mid 4th century CE)—from the monastic community of Mount Sinai to the czar of Russia.

In 1859 CE when Constantine von Tischendorf borrowed Codex Sinaiticus under the Russian Czar Alexander II, until the discovery of the letters of the Russian Archive which were studied by A. V. Zakharova of the National Library of Russia in 2009 CE, it was believed that:

Tischendorff visited the monastery and found a manuscript that was recognized by the monks as being very precious, He asked for permission to borrow it so he could study it in Cairo....saying: "this manuscript I promise to return safely"....The monks generously allowed him to borrow the manuscript and retained his letter with the promise to return it soon. Tischendorff left with the manuscript never to return (Charlesworth, 1979).

By arriving to the old city of St. Petersburg in Russia, Tischendorff became a wealthy man by selling the manuscript (Charlesworth, 1979). In 1933 CE, the British Museum bought Codex Sinaiticus for 100,000 pounds sterling. Currently, it settled in the British Library. Several

scholars of different backgrounds approached the history of the possession of Codex Sinaiticus from different perspectives, leading to several interpretations for the events. A. V. Zakharova provided the most recent study about the codex in the light of the newly discovered documents (Tab. 2).

Table 2 Codex Sinaiticus timeline according to the newly discovered letters of the Russian Archive

Date	Event
1844 CE	- The German scholar Constantine von Tischendorf visit to the Holy Monastery of St. Catherine and the discovery of a part of Codex Sinaiticus, as it was obtained for Frederick Augustus II King of Saxony (i.e. 43 folios in Leipzig University Library)
1853 CE	- Constantine von Tischendorf visit to the Holy Monastery of St. Catherine
1854 CE	- Constantine von Tischendorf visit to the Holy Monastery of St. Catherine
February 1859 CE	- Tischendorf discovered a greater part of Codex Sianiticus - Archimandrite Cyril was expected to be ordained as the Archbishop of Sinai, opposed by the Patriarch of Jerusalem - Tischendorf seek the assistance of Prince A. B. Lobanov-Rostovsky the Russian minister at the Ottoman court and A. E. Lagovsky the Russian Consul in Egypt in order to obtain the rest of the Codex Sinaiticus
May 1859 CE	- Tischendorf confirms and clarifies to his wife and to A. N. Volkonsky the Russian Minister in Dresden the willingness of the Sinaitic brethren to

Human Occupation Development

	<p>present the manuscript to the czar</p> <ul style="list-style-type: none"> - Verbal agreement between Archimandrite Cyril and Tischendorf in order present Codex Sinaiticus to the Czar of Russia Alexander II for Cyril's ordination in return
<p>-----</p> <p>August 1859 CE</p>	<ul style="list-style-type: none"> - Tischendorf confirms and clarifies to E. P. Kovalevsky the Russian Minister of Public Education the willingness of the Sinaitic brethren to present the manuscript to the czar
<p>September 1859 CE</p>	<ul style="list-style-type: none"> - Commissioned by the Russian Government, Tischendorf borrowed Codex Sinaiticus 'the world's most ancient codex' under the name of the Czar of Russia Alexander II after receiving a letter of guarantee from Prince A. B. Lobanov-Rostovsky ≠ simultaneously with the opposition of the monks towards lending the manuscript
<p>-----</p> <p>October-November 1859 CE</p>	<ul style="list-style-type: none"> - Codex Sinaiticus reached St. Petersburg for publication ≠ Codex Sinaiticus would be returned to the Holy Monastery of St. Catherine on demand - Confrontation between Archbishop Cyril supported by the Russians and the Patriarch of Jerusalem who relies on convincing the Turks
<p>November 1859 CE</p>	<ul style="list-style-type: none"> - Tischendorf arrives to St. Petersburg in order to discuss the publication prospects
<p>1860s CE</p>	<ul style="list-style-type: none"> - Press rumors about the original story of Codex Sinaiticus
<p>1860-1865 CE</p>	<ul style="list-style-type: none"> - Archbishop Cyril broke the rules of Mount Sinai monastic community, regarding property and revenues
<p>January 1860 CE</p>	<ul style="list-style-type: none"> - The ordination of Archbishop Cyril in Constantinople

Sacred landscape

April-May 1860 CE

- A. E. Lagovsky to Egor Petrovich Kovalevsky the Russian Director of the Foreign Ministry Asian Department, as a compensation would be determined by the Sinaitic brethren, unless the new Archbishop demands it back

April 1860 CE

- A. B. Lobanov-Rostovsky clarifies and confirms to Egor Petrovich Kovalevsky the willingness of the Sinaitic brethren to present the manuscript to the czar

- Agreement with E. P. Kovalevsky the Russian Minister of Public Education that Father Agathangelos the Cairo House Superior and former Kiev House Superior was chosen to be the representative who would present the Codex to the czar

October 1862 CE

- Codex Sinaiticus was presented by Tischendorf to the Czar of Russia Alexander II as an appreciation for the Russian Imperial patronage for the community 'manuscripts collection'

- British interest in Codex Sinaiticus, conditioned on its return to the Holy Monastery of St. Catherine

- The matter of the possession of the manuscript was transferred to the Russian Foreign Ministry, as it was discussed between A. V. Golovnin the new Russian Minister of Public Education and the Chancellor A. M. Gorchakov

- E. P. Novikov the Russian Minister in Constantinople to N. P. Ignatyev the Russian Minister at the Ottoman Court stressed on a decision would be taken in favor of the Russian government about the ownership of the Codex, following the suggestions of Chancellor Norov to start

Human Occupation Development

	negotiations with the monastic community of Mount Sinai
1862-1868 CE	- Tischendorf writes to the ordained Archbishop Cyril in order to formalize the previous agreement of presenting the Codex to the czar
1865-1866 CE	- Open confrontation between the Mount Sinai monastic community on one hand and Archbishop Cyril and his assistant on the other hand, regarding the rules of property and revenues
1867-1869 CE	- Archbishop Cyril was struggling for his title, relying on the support of Constantinople ≠ Archbishop Cyril's memorandum: there is no deal to present the manuscript to the czar
January 1867 CE	- The election of Archbishop Callistratus of Sinai
January 1867-August 1868 CE	- N. P. Ignatyev withhold the revenues of Mount Sinai monastic community received from Russia via Consulate General in Egypt
-----	≠ Exerted force-pressure by Count N. P. Ignatyev on the Holy Monastery of St. Catherine in order to yield the treasure to Russia
June 1867 CE	- Cyril Patriarch of Jerusalem called a Local Council to consider the matter of the Holy Monastery of St. Catherine
August 1867 CE	- N. P. Ignatyev informs Chancellor A. M. Gorchakov of controversies in the Holy Monastery of Mount Sinai, regarding property and revenues (i.e. personal use and the issue of Codex Sinaiticus) - The deposition of Archbishop Cyril - The ordination of Archbishop Callistratus of Sinai

Sacred landscape

September 1867 CE	- Cyril Patriarch of Jerusalem asked assistance from the Most Holy Synod of Russian Orthodox Church to Mount Sinai Monastic community and their new archbishop Callistratus of Sinai
Late 1867-June 1870 CE	- Sequestration of Mount Sinai monastic community land estates in Bessarabia
January 1868 CE	- Acknowledgement of the ordination of Archbishop Callistratus of Sinai by Ecumenical Patriarch Gregory who previously supported Archbishop Cyril
January-February 1868 CE	- Revenues withhold confirmed by I. M. Lex the Council General in Egypt to E. E. Staal to the Russian Director of the Foreign Ministry Asian Department
February 1868 CE	- E. E. Staal confirmed the settlement of the Archbishop's complication of Holy Monastery of St. Catherine to I. M. Lex and the importance of convincing Ismail Pasha the Khedive of Egypt with the ordination of Archbishop Callistratus
March 1868 CE	- Tischendorf asked Count A. V. Adlerberg the Imperial Court Minister to take measures towards definitive acquisition of Codex Sinaiticus by Russia, as Baron M. A. Korf inquired Tischendorf about the matter and refused his mediation offer
May 1868 CE	- N. P. Ignatyev asked Archimandrite Antonin 'Kapustin' the priest of the Russian Mission in Jerusalem in order to settle the issue of Codex Sinaiticus by granting Mount Sinai monastic community four orders and a negotiable amount of money, 10-12

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	<p>thousand rubles; in addition of solving the matter between Jerusalem and the Most Holy Synod of Russian Orthodox Church</p> <ul style="list-style-type: none">- A. Kumani the secretary of N. P. Ignatyev was appointed to discuss the issue with the residing Archbishop Cyril
June 1868 CE	<ul style="list-style-type: none">- N. P. Ignatyev to Archimandrite Antonin 'Kapustin', as the German scholar Constantine von Tischendorf was the cause of the misunderstanding; the willingness of Mount Sinai monastic community to present Codex Sinaiticus to Alexander II upon the acknowledgment of Archbishop Callistratus of Sinai by the Most Holy Synod of Russian Orthodox Church, (i.e. consenting the deposition of Archbishop Cyril, granting the orders, delivering the revenues and buying the Codex <i>"at least in order to be able to say that the Bible was bought and not filched"</i>, as the required amount was reported to W. I. Westmann the Assistant Foreign Minister- Mount Sinai Council confirmed to A. N. Nikolaev the Russian Vice-Consul of Egypt that the council is the donator of the Codex not the previous Archbishop Cyril
July 1868 CE	<ul style="list-style-type: none">- Archbishop Callistratus on behalf of Mount Sinai monastic community confirmed to N. P. Ignatyev that Codex Sinaiticus was presented to Alexander II the Czar of Russia
August 1868 CE	<ul style="list-style-type: none">- Count A. V. Adlerberg reported that the czar granted 9000 rubles and decorations to Mount Sinai monastic community

Sacred landscape

Summer 1868 CE	- Acknowledgement of the ordination of Archbishop Callistratus of Sinai by the government of Russia and the delivery of 3535 rubles to Mount Sinai monastic community, received from their property's in Russia (i.e. Bessarabia was the significant source)
September 1868 CE	- Callistratus of Sinai signed an official certificate which transferred Codex Sinaiticus to the full possession of the czar for 9000 rubles and decorated orders via Count N. P. Ignatyev
1869 CE	- Acknowledgement of the ordination of Archbishop Callistratus of Sinai by the government of Egypt
March 1869 CE	- Archimandrite Antonin confirmed the deposition of the previous Archbishop Cyril
November 1869 CE	- N. P. Ignatyev in Egypt and a new donation document was signed by Mount Sinai Council
November 1869 CE	- N. P. Ignatyev confirmed to W.I. Westmann the receipt of a signed and sealed donation document of Codex Sinaiticus
January 1870 CE	- Archbishop Callistratus signed for I. M. Lex a document about the receipt of the decorations and money
March-June 1870 CE	- N. P. Ignatyev reported to Archimandrite Antonin the financial settlement of problems caused by previous Archbishop Cyril, regarding the interest in the assets of Bessarabia and the taken valuables (i.e. church plate, vestments, jewelry, and records)

Human Occupation Development

1880s CE	- Press rumors about the original story
1930s CE	- Press rumors about the original story
1933 CE	- The National Library of Russia 'Russian Archive of St. Petersburg' (i.e. 5 folios) - The British Museum bought Codex Sinaiticus for 100,000 pounds sterling (i.e. currently, 347 folios in the British Library, London)

Recent findings generally support the version repeatedly described by Constantine Tischendorf. Published research (by I. Ševčenko above all) questioning the legitimacy and honesty of Tischendorf and the Russian Government in their dealings with Mt Sinai Community depended on the ambiguous behavior of Cyril Archbishop of Sinai. The documents reported in this work indicate that eventual purchase of the Sinai Bible by the Russian Government in 1868-1869 was formalized by Archbishop Callistratus and the Holy Council of Mt Sinai Community on their own free will, in accordance with the law, and without pressure from Count N. P. Ignatyev. The role of Count Ignatyev in the settlement of the conflict between the brethren and former Archbishop Cyril in 1870 and 1871 indicates that he enjoyed the confidence and amicability of Mt Sinai monks (Zakharova, 2009).

The possession of the movable works of art such as the manuscript(s) (i.e. Codex Sinaiticus) and some other icons were being transferred to the possession of other individuals, religious authorities or states under the mono-religious-political influence like the one which was exerted by the Russian government on the monastic community of Mount Sinai (i.e. the Most Holy Synod of Russian Orthodox Church):

The Russian archimandrite, Prophyrius Osphanski took some Sinai icons to Kiev in 1845-1850 CE (Dahari, 2000).

Not all the scholars who traveled to the Holy Monastery of Mount Sinai were out there for dual purpose like Constantine von Tischendorf (i.e. archive, study and collect ancient manuscripts). The first published catalogue was the one of the Greek manuscripts; it was published in Oxford by Grandsons in 1886 CE. In 1893 CE, Agnes Smith Lewis archived the Syrian manuscripts; in 1894 CE, Margaret Gibson archived

Sacred landscape

the Arabic manuscripts (Shuqier, 1917). Early tourists started to visit Sinai Peninsula in early 20th century CE. In 1950 CE:

The American Foundation of for the Study of Man, on behalf of the Library of Congress and in conjunction with Farouk I university in Alexandria, launched the Mount Sinai Expedition to microfilm those ancient works of reference which will change the face of biblical and other studies....In less than six months, nearly a million folios of manuscripts in twelve languages were microfilmed, a record hitherto unattained in the history of mankind (Attia, 1952).

In 1951 CE, Farouk I the King of Egypt established a new building adjacent to the southern walls of the monastery which currently houses the new library of the ancient manuscripts and the library of the old prints. In 1970s CE, the tourists started to visit the Holy Monastery of St. Catherine and the vicinity of Mount Sinai in relatively mass numbers (i.e. Tourists Period 'TP'). On 26th of May 1975 CE:

A fire damaged the church of St. George. The monks then decided to clear the debris beneath this church in the northern wall of the monastery. In the process....while repairing a wall in St. Catherine's Monastery on Mount Sinai workers have inadvertently broken through to unknown room in which were seen boxes full of ancient scrolls and books (Agourides et al., 1978) (Charlesworth, 1979).

3,000 items were found, including manuscripts and icons (i.e. all the discovered icons are not ancient): 18 folios from Codex Sinaiticus have been recovered (i.e. 412 of 730 original folios are now distributed between the British Library '347 folios', Leipzig University Library '43 folios', the Holy Monastery of St. Catherine '18 folios' and the National Library of Russia '5 folios'), 10 of the discovered manuscripts are complete and another 50 incomplete codices (Charlesworth, 1979).

Upon the rising interest of tourists in the vicinity of Mount Sinai in 1970s CE, a museum for the collection of the works of art was not obviously needed, as the treasury of Justinian's Basilica was and still being displayed for the pilgrims who are the original visitors of the monastery; during that period (i.e. Tourists Period), the tourists were flowing along with pilgrims to the monastery in an increasing number. All the works of art are represented by similar ones of its kind in Justinian's Basilica with an exception to the manuscripts. The major interest of the majority of pilgrims, travelers and tourists was in Justinian's Basilica and the Burning Bush, as the accessibility to other

buildings of the monastery was limited to the monks and specialized scholars. In 1978 CE, 50,000 tourists visited the vicinity of the Holy Monastery of St. Catherine. During the same year, the first museum was introduced in the vicinity; El Melga Ethnographic Museum was established outside the monastery in the newly constructed Bedouin settlement of the town of Katharina, as Justinian's Basilica was still the only display building for the ancient works of art. In 1981 CE, 200 visitors/day were allowed inside the Holy Monastery of St. Catherine (Dames & Moore 'USAID', 1979-1985). In 20th century CE, it is important to highlight the fact that the number of the newly introduced works of art to the collection of the monastery was tremendously declining, simultaneously with an increasing number of pilgrims, travelers and tourists; in addition to a simultaneous increase in the cataloguing and documentation projects which reached its peak by the end of 20th century CE.

Among the most important catalogues of the 2nd half of the 20th century CE, the Catalogue of all Manuscripts in the Monastery of St. Catherine on Mount Sinai by Kamil Murad; the Catalogue of Slavonic Manuscripts by Ioannes Chr Tarnanides in 1988 CE 'Hellenic Association for Slavic Studies'; the Slavonic Manuscripts Project in 1992-contemporary CE:

43 Slavic codices and fragments of the 10th/11th-18th century, most of them written in Church Slavonic of various redactions, both in the Cyrillic and the Glagolitic script.....new findings of 1975 added further 42 units, among them six Glagolitic ones of the 10th-12th centuries.....Serbian codices predominate, and the core of the collection came into being during the 13th and 14th centuries (Miklas, 2007).

Additionally, there are the catalogues of the Sinaitic Manuscripts Documentation Project by the Holy Monastery of St. Catherine in 2002-contemporary; and the Library Conservation Project - Manuscripts Survey by St. Catherine Foundation in 2001-2008 CE (Fig. 38).

2.2.4 The museum age

Under a demanding mass tourism industry, reaching 300,000 tourists in early 21st century CE, and the relatively significant increase in the publications about Sinai Peninsula (i.e. more than 1,800 scientific publications, as the majority directly or indirectly mentioned the



(a - 2009 CE)



(b - 2009 CE)

Figure 32 Medicinal Plants Conservation Projects in the High Mountains of Sinai Peninsula at El Melga Plain 1590m ASL on 12th of March 2009 CE: (a) Greenhouse of the Medicinal Plants Conservation Project 'MPCP' at El Melga Plain; (b) Vegetables, fruits and herbs drying project - South Sinai Regional Development Program 'SSRDP': Sinai Peninsula Research 2000-2010 CE



(2010 CE)

Figure 33 Biblical Mount Sinai; UNESCO World Heritage Site 'WHS' no. 954 at St. Catherine Natural Protectorate in August 2010 CE: Sinai Peninsula Research 2000-2010 CE



(2009 CE)

Figure 34 Holy Monastery of St. Catherine; the vicinity of biblical Mount Sinai at W. El Dier 'Holy Valley Tuwa' 1580m ASL on 23rd of April, 2009 CE: Sinai Peninsula Research 2000-2010 CE



(2009 CE)

Figure 35 Justinian's Basilica 530-545 CE, the Holy Transfiguration of our Lord and Savior Jesus Christ on 23rd of April, 2009 CE: Sinai Peninsula Research 2000-2010 CE

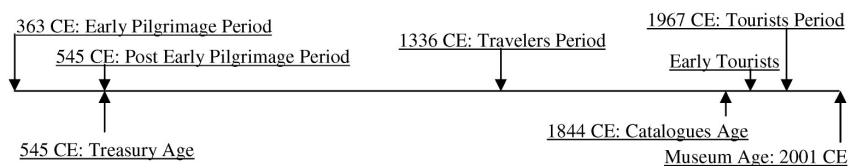


Figure 36 Treasury, Catalogues and Museum Ages; Early Pilgrimage Period, Post Early Pilgrimage Period and Tourism Period: Sinai Peninsula Research 2000-2010 CE



(2009 CE)

Figure 37 The Mosaic of the Transfiguration of 6th century CE on 23rd of April, 2009: Sinai Peninsula Research 2000-2010 CE



(2009 CE)

Figure 38 Library of the Ancient Manuscripts 'King Farouk I of Egypt' on 23rd of April 2009 CE: Sinai Peninsula Research 2000-2010 CE'

manuscripts and/or icons of the monastery); accordingly, the need for a museum for the collection of the works of art became a necessity in order to display the most significant ancient possessions. In 2001 CE under the supervision of the Metropolitan Museum of Art 'MET-New York', a small museum was established inside the monastery in a small building adjacent to the northern wall of Justinian's fortress. The ticket of the museum offers a moderate contribution to the conservation and restoration activities of the works of art, as the entrance of the pilgrims, travelers and tourists to the monastery is free as it has always been since the establishment of the monastery at the holy site of the Burning Bush.

In July 2009 CE, via a joint project in collaboration between the current possessors of the folios of Codex Sinaiticus, an online website was launched after the conservation of the gospel 'Codex Sinaiticus Project', reviving and presenting the world's most ancient codex to the humanity under the theme '*Experience the Oldest Bible*' after 1650 years of its inscription.

2.2.5 Summary

Although the works of art of the Holy Monastery of St. Catherine is considered one of the most significant collections worldwide, as it is one of the landmarks of Byzantium; there is no doubt that the geographical remoteness of the of the monastery which lasted for 1425 years since its establishment in 545 CE till 1970s CE played a potential role in the development of the aspects related to the works of art. Till the second half of the 19th century CE, it is important to highlight the fact that the holiness of the site dominated the interest of pilgrims and travelers (i.e. among them scholars of different backgrounds), relatively dragging their attention away from the works of art, considering the functional perspective of the collection and its contribution in Mount Sinai monastic life, than being considered as a collection to be displayed for other purposes (i.e. global cultural perspective).

On the other hand, the number of pilgrims and travelers was increasing over Post Early Pilgrimage Period 'PEPP' and Travelers Period 'TP', but not in significant numbers which would not allow the personnel of interest to access the works of art. Along the same two periods, the collection was mentioned in brief via the writings of those pilgrims and travelers without mentioning many details about the

collection and its value due to the lack of a scientific approach, with an exception to the late Travelers Period 'TP' when the first catalogues were accomplished by scholars like Grandsons, Agnes Smith Lewis and Margaret Gibson. The catalogues of Mount Sinai's treasury-collection were accomplished in a relatively late period compared to their European equivalent. Probably the loss of the possession of Codex Sinaiticus relatively contributed in raising the suspiciousness of Mount Sinai monastic community towards any scholars' attempts and their real intensions. In the case of the Holy Monastery of St. Catherine, the real factor which triggered the establishment of the museum of the works of art is the demanding mass tourism industry which introduced different type of visitors who are neither pilgrims nor travelers or scholars, but just visitors of cultural interest in modern exhibitions for the works of art. Justinian's Basilica, the library-scriptorium and the gallery of icons have always been playing their role as the houses of the treasury-collection of Mount Sinai.

2.3 Reflections on the aesthetics of a sacred landscape: biblical Sinai

2.3.1 From a metaphysical beauty of a pilgrimage to the works of art

There are many people, I believe who have concluded that the peninsula of Sinai must already have been a well explored country, since so many travelers have visited it; but, owing to various local causes, there is probably no other country in which travelers have been led to carry out more fully their ovine propensity to follow exactly in each other's steps; and consequently, it is only the main wadys, or valleys, which form the high-roads, and one or two principal mountains, that have been explored, and even those very hastily and incompletely (Holland, 1869) (Fig. 39).

For almost two thousand years the biblical text led the spirit of the pilgrims, travelers and tourists:

And the Lord went before them by day in a pillar of cloud, to lead them the way; and by night in a pillar of fire, to give them light; to go by day and night {Exodus XXIII:XXI}.

It created a harmony between the written accounts, works of art, natural landscape and biblical spirit. The spiritual heart of the

Sacred landscape

peninsula is the everlasting destination, the sacred wilderness of the Holy Valley:

Put off thy shoes from off the feet, for the place whereon thou standest is holy ground {Exodus III: IV}.

And Mount Horeb:

And mount Sinai altogether on a smoke, because the lord descended upon it in fire: and the smoke thereof ascended as the smoke of a furnace, and the whole mount quaked greatly {Exodus XIX: XVIII}.

Among 335 known pilgrims, travelers and tourists between 2nd century BCE - 1951 CE; there are ten major artists during CE: L. E. S. J. de Laborde 1828/1836?, I. Taylor 1830, F. Arundale 1833, E. Finden 1836, A. W. Crawford 1836-1837, J. M. Bernatz 1837, D. Roberts 1839, C. Tobin 1854, C. W. Wilson 1867-1868 and P. Lenoir 1872. Accordingly, the 1830s CE could be concluded as the travel age of the Sinaitic artists (i.e. representing seven artists). The most famous works of art during the 1830s is the one of David Roberts in his famous illustrated account *'The Holy Land, Syria, Idumea, Arabia, Egypt and Nubia'*. Another important Sinaitic works of art was accomplished by C. W. Wilson by the end of the 1860s CE published under the title *'Picturesque Palestine, Sinai and Egypt'*. During the same period, E. H. Palmer of the Palestine Exploration Fund attached some paintings in his written account *'The Desert of the Exodus: Journeys on Foot in the Wilderness of the Forty Years Wanderings'*. When the Holy Land witnessed the age of Black and White photography, the Photo Department of the American Colony of Jerusalem played a vital role among the photo services which were operating in the Middle East before 1900 CE (Eric and Matson Negatives, 1966-1981). Although the travelers of the 19th century CE reflected multidisciplinary scientific backgrounds, the biblical spirit was still dominating the direction of the travelers especially during the first half of the century. The dominating biblical spirit led the approach of the artists towards the metaphysical-theological beauty of the sacred landscape; the artists were exactly and unbelievably drawing the same scenes, even the black and white photos came to reflect the same biblical scenes!

On one hand the works of art reflect the same biblical scenes being led by the metaphysical-theological beauty; but on the other hand, the cultural and scientific background of the artists was reflected on the composition of the works of art. The (a) and (b) paintings represent the

artists' approach in improving landscape according to their backgrounds, while painting (c) represent the actual landscape when compared to the reality represented in black and white photo (d) in early 20th century CE. All the scenes share double-value picturesque beauty which sounds pleasing although it was repetitively sketched by different artists over a century (i.e. theological and natural values of the landscape). The works of art are composed of different styles of lines, surfaces and colors, presenting rough objects such as rocks, broken grounds, plains, valleys, mountains and wooden shrubs (Harrison et al., 1991) (Fig. 40).

2.3.2 A transition in the conception of Sinaitic beauty

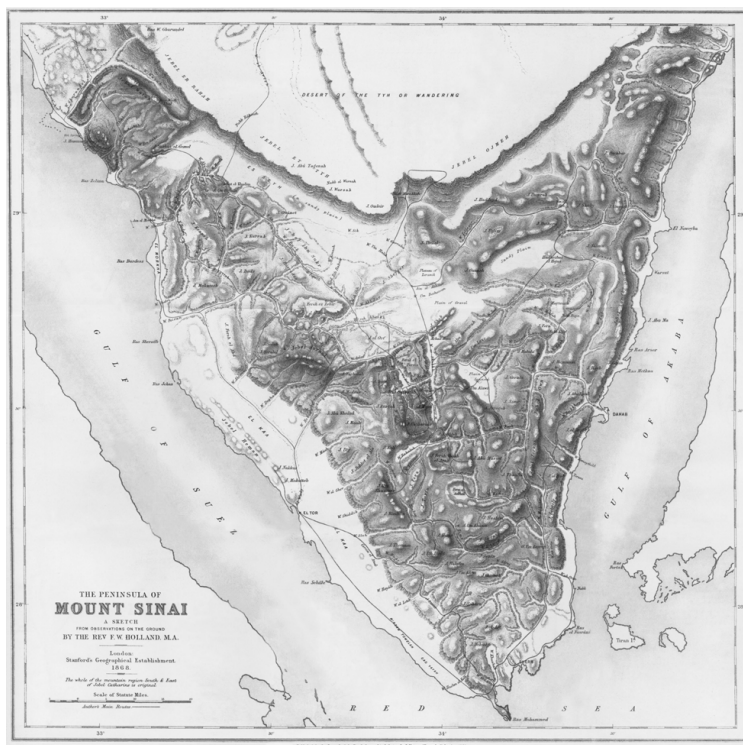
The second half of the 19th century CE was a transition phase in the artistic perspective for the Sinaitic beauty. It was a transition from pilgrims and travelers to scientists; painting to photographs; for aesthetics function and value:

Transition in the history of philosophy from metaphysics to what is predominantly philosophy of science (Ames, 1941).

Although C. W. Wilson joined the same scientific expedition in 1869 CE with E. H. Palmer, both of them sketched different perspective for the picturesque beauty (i.e. (b) and (c) paintings), reflecting the transition phase. The Positivism philosophical movement during the 19th century CE is reflected in the Sinai Peninsula via the Manna argument. Manna, the heavenly food upon the Sons of Israel was a very argumentative issue between the metaphysical theology and the philosophy of science, the everlasting argument of humanity.

Since 19th century CE, travelers and scientists tried to figure out possible sources of '*Manna Israelitorum*'; regular travelers by the aid of observation and scientists by the aid of scientifically proved evidence. Both of them did not represent the pilgrims' perspective of the metaphysical theology for the Sinaitic beauty and the glorious acts of god:

Despite the easy way with which men dismiss miracles by ascribing them to a law of nature, does not I ask, the law of nature remain, at the last analysis, all unexplained and dark as ever? To try to harmonize the wonderful acts of God with the laws and arrangements of nature, to spend one's energies as if in a hard task to bring them into accord, just as if they were not in a hard task to bring them into accord, just as



(1868 CE)

Figure 39 The Peninsula of Mount Sinai, sketch map as reviewed by F. W. Holland in 1868 CE 'the honorary secretary of Palestine Exploration and Sinai Survey Fund'

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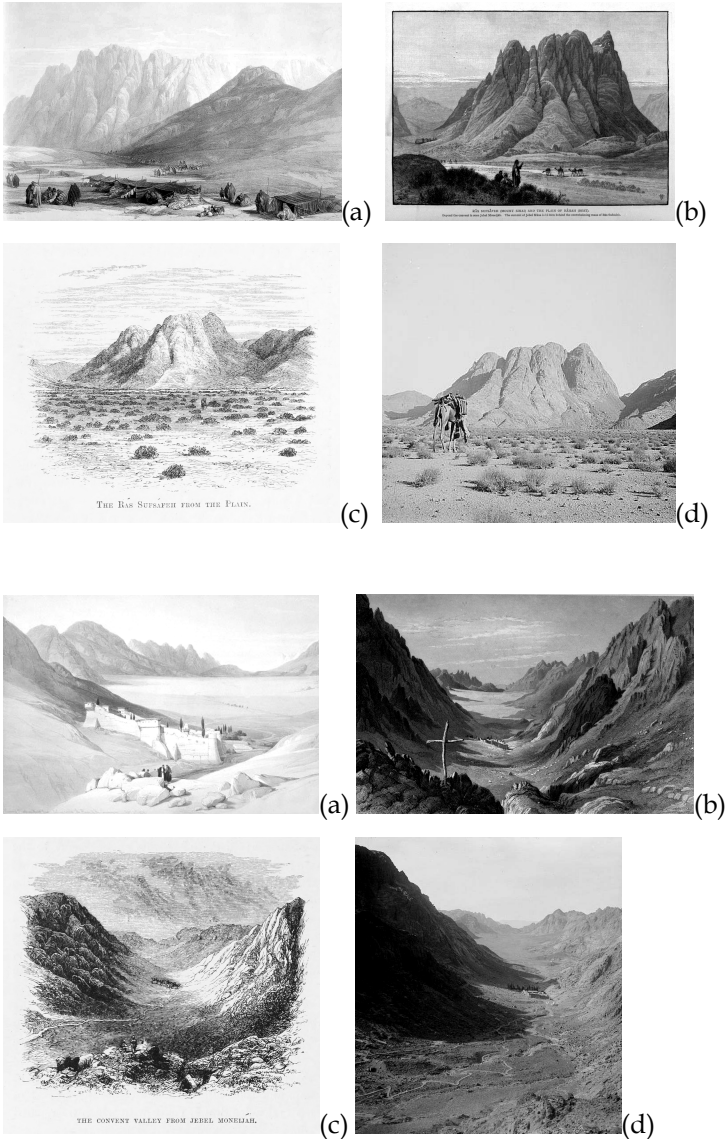


Figure 40 Group (1): Mount Horeb/Gebel Sefsafa by: (a) David Roberts in 1839 CE; (b) Charles William Wilson in 1868-1869 CE; (c) Edward Henry Palmer 1867/1870 CE; (d) American Colony of Jerusalem in 1900-1920 CE; Group (2): The Holy Valley and El Raha Plain by: (a) David Roberts 1839 CE, (b) Charles William Wilson 1868-1869 CE, (c) Edward Henry Palmer 1867/1870 CE; (d) American Colony of Jerusalem 1900-1920 CE

if they were not in perpetual accord already, is a pitiable task; and he is a poor common spirit, who, dealing with only the last results of God dealings, the little things merely under his eye, talks about a controversy between nature and God, and brings down the majesty of the Infinite One to the level of his own narrow understanding. Such a man has never learned what the words omnipotence and omniscience mean (Ritter, 1865).

Accordingly, the philosophy of science point of view concludes that one of the main reasons for the geo-distribution limitation in the works of art was caused by the perspective of the metaphysical theology for the Sinaitic beauty:

There can be no doubt, too, that the religious enthusiasm which has led many travelers to the country, however much of it may claim our sympathy, has nevertheless tended in a very great degree to lower the value of the information obtained. A man who goes out with the foregone conclusions as to what the country ought to have marched, is almost sure to favour his own prejudices to the exclusion of truth (Holland, 1869).

2.4 Themes of traditional-modernized daily life of the Gebaliya tribe in the High Mountains of Sinai Peninsula

At the beginning of the second decade of the 21st century CE, the traditional daily life of the nomadic Bedouin communities in the Middle East relatively and/or absolutely changed according to the geographical setting of the community of interest, determining the level of subjection to various multidisciplinary factors. Since the emergence of permanent rural-urban settlements in 1970s CE in the High Mountains of Sinai Peninsula (i.e. UNESCO World Heritage Site No. 954), the Bedouins of the Gebaliya tribe partially preserve their traditional day-to-day activities under the exerted pressure of mass modernization and urbanization policies and different dynamic aspects, shifting over consecutive economical transition phases. This section presents themes of traditional-modernized day-to-day activities and festive events of the Gebaliya tribe, as it defines the interconnected-interchanging relation between the daily social dynamics with respect to geographical, geo-political, economical, demographical, cultural and environmental aspects on one hand, and the level of preservation and development of these themes on the other hand. Post the economical transition phase of the EU-Commission fund, South Sinai Regional

Development Program '2006-2010 CE', followed by Egyptian National Reforms Revolution of January 25, 2011 CE, it is crucial to identify the impact of the domestic-national/international development policies on the Bedouin day-to-day activities and festive events in terms of practice, preservation and documentation, in the light of the socioeconomic community needs and the Convention for the Safeguarding of the Intangible Cultural Heritage which was ratified by the Arab Republic of Egypt in August 2005 CE.

2.4.1 The scholars of the 20th-21st centuries CE

Since late 19th - early 20th centuries CE, the intangible heritage of the High Mountains of Sinai Peninsula is studied-documented in an anthropological-scientific approach, compared to the previous pilgrimage and travel accounts of the past centuries. The intangible heritage of the mountain range is widely approached via studies of regional perspective, taking into account the mountain range as a part of the whole Sinai Peninsula which shares the region a common heritage to a great extent. Nevertheless, the scholars and anthropologists highlighted the special characteristics of the intangible heritage of the mountain range caused by its unique geo-historical and environmental setting within Sinai Peninsula, leading to more focused studies on the natural-cultural aspects of the mountain range and their impact on day-to-day activities and festive events of the inhabitants (Shams, 2011e).

In 1916 CE, Naoum Shuqier the director of the Historical Section in War Ministry 'Royal Egypt, 1889-1914 CE' completed the first detailed account about the intangible heritage of Sinai Peninsula Bedouins '*The History of Sinai and Arabs with Resume of the History of Egypt, Syria, Mesopotamia and Arabia*' (i.e. Arabic ref.: *تاريخ سيناء القديم والحديث و جغرافيتها*) (Shuqier, 1917); it was followed by the accounts of Refa'at El Gohary, an ex-general in the Egyptian Military who served in Sinai Peninsula during the 1st half of 20th century CE, as he published two interconnected accounts:

- 1 'Law of the Desert: Customs and Traditions' in 1960 CE (i.e. Arabic ref.: *شريعة الصحراء: عادات و تقاليد*) (Gohary, 1960)
- 2 '*Sinai the Land of the Moon*' in 1965 CE (i.e. Arabic ref.: *سيناء ارض القمر*) (Gohary, 1965)

The accounts of Refa'at El Gohary are highly influenced by Naoum Shuqier, introducing a question about the historical period(s) reflected in these accounts; in other words, whether the available accounts reflect reel time characteristics of the intangible heritage or historical ones (i.e. pitfall I). The account of Naoum Shuqier is the most famous and widely spread among the Bedouin tribes of Sinai Peninsula due to the Arabic language of the original text. The intangible heritage section of Shuqier's account could be classified into the following:

- 1 oral history of the tribes which is highly criticized by most of the Bedouin tribes of Sinai Peninsula due to the exclusivity of biased oral Bedouin sources (i.e. pitfall II)
- 2 social practices 'day-to-day activities and festive events', and tribal customary law which are relatively approved by the Bedouin tribes with some argumentative interpretations by the author, as such practices reflect common tribal intangible heritage
- 3 partial focus on oral traditions and expressions
- 4 very limited details about performing art and traditional craftsmanship (Shuqier, 1917) (Shams, 2011e)

Regardless pitfalls (I) and (II), Shuqier's account was a great progress at the time. The accounts of Shuqier and El Gohary reflect the intangible heritage of the Bedouin tribes of Sinai Peninsula Post World War I 'WWI' economical transition phase '1914-1918 CE' in early 20th century CE.

There is no doubt that the approach towards the intangible heritage of the mountain range post Six Days War economical transition phase 'June 5, 1967 CE' (i.e. Israeli military occupation for Sinai Peninsula 1967-1982 CE) varied according to the scientific gap in theory and practice, leading to specialized studies and scholarly accounts in terms of topics and geographical scope, under both historical and reel time perspectives. Multidisciplinary scientific contributions to intangible heritage were conducted by anthropologists, ecologist-environmentalists, human geographers and historians-archaeologists; all taking into consideration pitfalls (I) and (II). Most of the scholarly accounts were updated and published between 1980s-2000s, providing a long time span for deep understanding, especially when the topics of interest concern about comparative transitions:

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- 1 Emmanuel Marx 'anthropologist' focused on regional Bedouin issues 'Sinai Peninsula/South Sinai': socio-ecology, socio-economy, migration patterns, local-regional trade, employment, smuggling and pilgrimage, (Marx, 1976, 1977, 1980, 1984, 1985, 1987, 1999, 2000, 2003, 2004, 2007, 2013)
- 2 Frank H. Stewart 'anthropologist' focused on regional Bedouin issues 'Sinai Peninsula/Central Sinai': tribal customary law, tribal geo-boundaries and history of migration (Stewart, 1986, 1987, 1991) (Stewart et al., 1988)
- 3 Clinton Bailey 'linguist' focused on regional Bedouin issues 'Sinai Peninsula': tribal customary law, poetry, proverbs, history of migration and socio-ecology (Bailey, 1985, 1991, 2002, 2004, 2009) (Bailey et al., 1981, 1991)
- 4 Smadar Lavie 'anthropologists' focused on Mezena Bedouin issues 'South-eastern Sinai Peninsula/South Sinai': socio-economy, geo-political and tribal social practices (Lavie, 1991)
- 5 Avi Perevolotsky 'ecologist' focused on local-regional Bedouin issues 'South Sinai/High Mountains of Sinai Peninsula': socio-ecology (Perevolotsky, 1979, 1981) (Perevolotsky, 1989)
- 6 Martin I. Glassner 'geographer' focused on regional Bedouin issues 'South Sinai': socio-economy and geo-political (Glassner, 1974)
- 7 Dan Rabinowitz 'anthropologist' focused on regional Bedouin issues 'South Sinai': socio-economy and geo-political (Rabinowitz, 1985)

Over the next economical transition phases of Camp David Peace Treaty '1979 CE', Egyptian economical reform-privatization policy 'late 1990s - early 2000s CE' and EU-Commission South Sinai Regional Development Program - SSRDP '2006-2010 CE' (i.e. currently, the Egyptian National Reforms Revolution of January 25, 2011 CE), the intangible heritage scholarly accounts were widely replaced by social and demographic surveys, being conducted by national-domestic/international organizations for socioeconomic development and economic conservation of cultural-natural resources:

- 1 Dames & Moore - USAID 'early 1980s CE' (USAID, 1981-1985)
- 2 EU-Commission '1996-2001 CE' (St. Catherine Protectorate PAMU, 2003)

- 3 ICOMOS (ICOMOS, 2002) (UNESCO, 2008)
- 4 UNDP, GEF and GTZ '2002-2007 CE' (UNDP, 2002)
- 5 EU-Commission and DFID '2003-2004 CE' (SEAM, 2003-2004)
- 6 EU-Commission '2006-2010 CE' (SSRDP, 2006)

Actually, very few scholarly accounts were conducted as a result of the previously mentioned social and demographic surveys due to the inexistence of publication(s) plan(s) and/or specialized personnel who would orient the end-results towards such a purpose. There are few exceptional cases such as:

- 1 Joseph J. Hobbs 'geographer' in late 1980s - mid 1990s CE who focused on local Bedouin issues 'High Mountains of Sinai Peninsula': geo-history, socio-ecology, socio-economy and smuggling (Hobbs, 1995, 1996, 1998) (Hobbs et al., 1998)
- 2 John Grainger 'nature reserves specialist' focused on local Bedouin issues 'High Mountains of Sinai Peninsula': socio-ecology (Grainger et al., 1998) (Grainger, 2003) (Grainger et al., 2008)
- 3 Francis Gilbert and Samy Zalat 'ecologists' in 1980s CE-contemporary focus on local Bedouin issues 'High Mountains of Sinai Peninsula': socio-ecology (Zalat et al., 2008)

2.4.2 Traditional-modernized day-to-day activities

Since 1970s CE, forward on, the daily life in the High Mountains of Sinai Peninsula changed dramatically in comparison with the traditional nomadic daily life due to the eco-cultural tourism activities which strengthened its position as the main economical activity. Currently, the Gebaliya Bedouins practice two main life styles; each based on his/her job-employment profile:

- 1 rural/urban-based profile 'town of Katharina (Fig. 41)/cluster-satellite villages-settlements; population: 4,880 individuals in early 2000s CE - 75% Bedouins' (SEAM, 2003-2004): the elemental social unit of the community is four rooms household with front partially covered (i.e. '*Arisha*') open-air yard (i.e. '*Mak'ad*'), as the house is built by prefabricated hollow bricks which are coated with granite stones from the outside and roofed with wooden beams (i.e. Gebaliya Bedouins of higher income construct a reinforced concrete

structure at the initial phase) (Fig. 42). The Gebaliya house is equipped with basic electrical devices (i.e. radio, satellite television, fridge, fan...etc.). Current job-employment opportunities include:

- a eco-cultural tourist guide(s) and/or cameleer(s) on Mount Sinai (i.e. the hot economical spot of the mountain range) who usually start their work early in the morning, short after midnight, as they receive the flow of tourists near by the Holy Monastery of St. Catherine who arrive from the Red Sea resorts on the Gulf of Aqaba (i.e. Sharm El Sheikh; Dahab; Nuweiba'; Taba). The guides and cameleers guide back the tourists to the monastery after sunrise via the dirt track of Siqqat Abbas Basha '1853-1854 CE' and/or only on foot via the Byzantine '3rd-4th centuries CE' rock steps path of Siqqat Sydina Musa, as the Gebaliya Bedouin guides used to do with pilgrims, tourists and travelers over the past centuries
- b Mount Sinai cafeteria men who spend an average of two weeks shift near the summit and along Siqqat Abbas Basha, serving hot and soft drinks, biscuits and blankets-mattresses 'summit service', while selling to the visitors alabaster artifacts, local rocks-stones and guide books
- c Bedouin taxi drivers who connect the Red Sea resorts with the town of Katharina 'tourism main traffic', and they connect the mountain range with Tur city 'capital of South Sinai Governorate' which is frequently visited by local people for paperwork and for better social-medical services
- d shop owners who sell traditional Bedouin dresses, local rocks-stones, medicinal plants, handicrafts, souvenirs, craftsman tools and other regular goods/food products
- e restaurant and café owners, including the newly introduced internet cafes in early 21st century CE
- f labor force which is mainly involved in the construction of new houses, mountainous orchards and digging of water wells
- g owners of local Bedouin camps who provide semi-traditional accommodation
- h labor force of the Holy Monastery of St. Catherine which is involved in the traditional-historical day-to-day activities in

cooperation with the Greek Orthodox monks, such as construction, mountainous agriculture, baking, door keeping and bookselling

- i temporary-permanent labors-employees who work for the domestic-national/international projects and/or nonprofit/for-profit organizations (e.g. employees who work in the headquarter and other facilities of St. Catherine Natural Protectorate)
- j concurrently with the Egyptian National Reforms Revolution of January 25, 2011 CE when the security forces were totally disturbed throughout the peninsula, the Gebaliya Bedouins played their crucial traditional role in protecting the Holy Monastery of St. Catherine in cooperation with the official authorities, as the tribe has ever been doing since 6th century CE when the Byzantine emperor Justinian '527-565 CE' sent 200 soldiers to protect the monks and the newly established fortress at the time (Shuqier, 1917) (Shams, 2011e, 2011f, 2012a, 2012b, 2012c)

All the previously mentioned categories of the apparent manhood society practice their jobs on daily-basis, spending the afternoons in socialization, whether on cafes after the night prayer of the Muslims (i.e. '*Asha*'), or at the front yards of their houses among their families, relatives and friends. Women play a very vital role in the day-to-day activities of the Bedouin community, especially with the rapidly increasing number of female students since late 1990s - early 2000s CE. Traditionally, Bedouin females start their early life as shepherd girls; after marriage, Bedouin women are socioeconomically responsible for household management, raising children, baking, collecting medicinal plants, supporting their husbands in mountainous agriculture and working handicrafts for daily use, including the sewing of traditional Bedouin tents which are made out of camels' wool (i.e. *Beit Sh'ar*). As a result of the current urbanization and modernization process, the previously mentioned day-to-day activities of Bedouin females take place according to the geographical setting. In other words, concerning the rural/urban-based profile, the Bedouin girls go to school instead of herding, with exception to short distance herding around the current settlements; they are still practicing the traditional activities but on a different level, under the newly introduced vision by nonprofit/for-profit organizations where the handicrafts and medicinal plants are worked and collected for potential commercial purposes.

- 2 semi-nomadic rural based profile 'seasonal-temporary/reused abundant settlements; population: 100 families/300 orchards prior 1967 CE; 30-40 families/100 orchards in 1970s CE; 20 families/20+ orchards/21st century CE' (Hobbs, 1995) (Matrahazi, 2010): partially, it is the last standing profile of the traditional nomadic day-to-day activities in the mountain range. The elemental social unit of the semi-nomadic community is one-two room(s) household with partially covered (i.e. *'Arisha'*) yard (i.e. *Mak'ad*) and a fire-pit (Fig. 43 & 44). Current job-employment opportunities include:
 - a 20 Gebaliya families practice mountainous agriculture for a maximum duration of 6 months/year 'April-October', mainly providing traditional accommodation (i.e. ecolodge) for the eco-cultural tourists who usually hike in the mountain range during summertime, selling them organic fruits and vegetables between June to October. The Gebaliya Bedouin women support their husbands in preserving the mountainous orchards, as they still practice some traditional day-to-day activities such as baking and sewing tents which are totally and/or partially abandoned by their rural/urban-based counterparts (i.e. the Gebaliya women of both profiles almost share the same lifestyle during wintertime). The average age of this job-employment profile is above 40 years old
 - b eco-cultural tourist guide(s) and/or cameleer(s) who guide 1-15 day(s) hike(s) in the mountain range (Fig. 45)
 - c mountain rangers working for St. Catherine Natural Protectorate (i.e. selected among the Bedouins who are preserving a level of interest in the mountains/valleys in order to guarantee efficient patrolling process)
 - d medicinal plants farmhouse(s)/orchard(s) (e.g. Ahmed Mansur Medicinal Herbs School at W. Tilah 1350m ASL)

2.4.3 Festive events: a wedding and a ceremony

On June 18, 2009 CE, it was the wedding day of Mohamed Eid 'B.Sc. Computer Science/intangible heritage researcher' of the Gebaliya tribe which took place near by his family's house at W. EL Sheikh 1480m ASL. People of different backgrounds were invited to the wedding day which starts early in the morning on two different levels (i.e. Gebaliya and other South Sinai Bedouins; in addition to national-

domestic/international employees who work for nonprofit/for-profit organizations in the town of Katharina and South Sinai region):

- a Bedouin females celebration in the bride's tent which is constructed out of wooden beams structure, covered with camels' wool from all directions with partial exception for the front side
- b Bedouin tribesmen celebration in the groom's tent, where the roof is the only covered part (Fig. 46)

Early in the morning, some tribesmen start cooking the traditional Middle Eastern Bedouin meal, a mix of rice and meat; while the tribesmen gather in the tent, discussing various issues such as national development policies, activities of current nonprofit/for-profit organizations, environmental issues (i.e. water is the basic concern of arid land communities) and other tribal-private issues. Meanwhile, the tribesmen watch the cameleers who ride in front of the growing gathering while tea is being regularly served (Fig. 47), as the peak of the event takes place in the afternoon when the food is served in common wide dishes and/or individual packs for the ones who might want to take their share back home, followed by serving traditional Bedouin tea flavored with mountain mint (i.e. *Habaq*), or wild flowers. Earlier during the same year, on March 11, 2009 CE, a traditional Bedouin ceremony (i.e. *El Foela*) was organized by the elders of the Gebaliya tribe (i.e. Sheikh Musa Awad and Musa Abul-Haym) in cooperation with Zoltan Matrahazi (i.e. web-developer who promotes the mountain range via a series of websites), celebrating the opening of El Freish Retreat. It is a renovated mountainous orchard which serves as an ecolodge (i.e. 20 other mountainous orchards are on the list of what so called Baraka Gardens) (Matrahazi, 2010). El Foela ceremony day follows the same sequence of the traditional Bedouin tribesmen gathering, in addition to a midday prayer and the incense is lit, willing and praying for all the good for the Bedouin community (Fig. 48).

2.4.4 Summary

Accordingly, the initiative of studying the intangible heritage of the mountain range in early 20th century CE was deeply enriched—in practice—during 1970s CE, as it was greatly compromised since early 1980s CE into social and demographic surveys with the few previously mentioned exceptions. Although pitfalls (I) 'historical/reel time

context' and (II) 'biased sources' were greatly avoided in the 1970s CE, but up to date, there are very few unfunded or scientifically planned attempts by knowledgeable and educated local Bedouins to be the interrupters and documenters of their own intangible heritage, avoiding any misinterpretation and financial resources consumption by the anthropological and sociological research projects (i.e. the most significant attempt in the mountain range is the one of Mohamed Eid who collects hundreds of poems, proverbs and short oral literature). Such studies and researches would be feasibly oriented towards socioeconomic sustainable development and economic conservation of natural-cultural resources:

Considering the importance of the intangible cultural heritage as a mainspring of cultural diversity and a guarantee of sustainable development (UNESCO, 2003).

There is no doubt that the previously mentioned potential aspects acted as constraints, shaping a feasible lifestyle in the mountain range, centered around Mount Sinai since 4th century CE with very high tendency to eliminate rural mobility towards stable rural-urban settlements, subjecting the intangible heritage of the mountain range to real challenges and threats. It must be highlighted that the Egyptian National Reforms Revolution of January 25, 2011 CE will never approach its final goals unless the intangible cultural heritage of the local communities is taken into consideration—in practice—within the national development programmes.



(2009 CE)

Figure 41 Town of Katharina and the newly constructed mountainous orchards by the Gebaliya tribe since the emergence the urban centre of the High Mountains of Sinai Peninsula in 1970s CE, on 19th of June, 2009 CE: Sinai Peninsula Research 2000-2010 CE



(2009 CE)

Figure 42 A group of Gebaliya Bedouin houses at El Melga Plain 1600 m ASL (G. Rubsha 1858 m ASL) on 10th of March, 2009 CE: Sinai Peninsula Research 2000-2010 CE



(2008 CE)

Figure 43 Saleh Rizq, Gebaliya Bedouin eco-cultural tourist guide at Farsh Umm Sila 2300 m ASL (G. Katharina 2642 m ASL) in June 2008: Sinai Peninsula Research 2000-2010 CE



(2009 CE)

Figure 44 Mountain shelter of Sibyel's orchard no. O194 Tur Sina Map at W. El Mathar 'Umm Khuraf' 1870 m ASL on 20th of June, 2009 CE: Sinai Peninsula Research 2000-2010 CE'



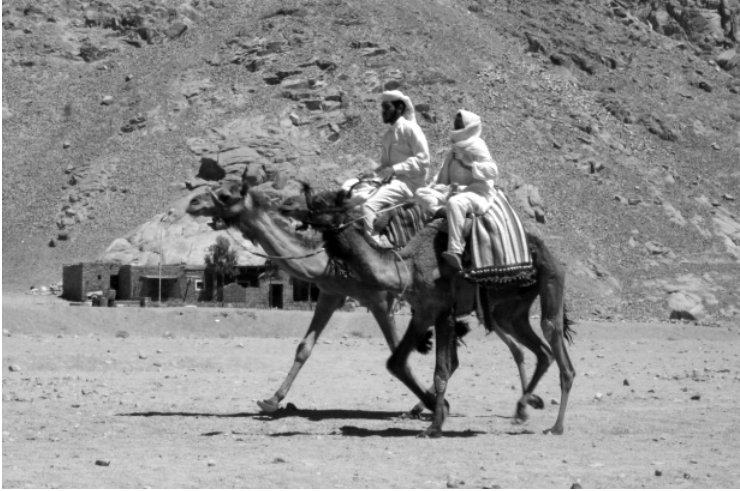
(2008 CE)

Figure 45 Fireplace at W. Gisum 1630 m ASL on 16th of August, 2010 CE: Sinai Peninsula Research 2000-2010 CE



(2009 CE)

Figure 46 Wedding day of Mohamed Eid of the Gebaliya tribe, modern tribesmen tent at W. El Sheikh 1480 m ASL on 18th of June 2009 CE: Sinai Peninsula Research 2000-2010 CE



(2009 CE)

Figure 47 Wedding day of Mohamed Eid of the Gebaliya tribe, camels ride as an entertainment activity at W. El Sheikh 1480 m ASL on 18th of June 2009 CE: Sinai Peninsula Research 2000-2010 CE



(2009 CE)

Figure 48 El Foela ceremony day, traditional tribesmen tent 'Beit Sh'ar' at Farsh Abu A'lwan 'Shamma'a' avg. 1600 m ASL on 10th of March 2009 CE: Sinai Peninsula Research 2000-2010 CE

3. Towards a quantification model: the accountability of the for-profit and nonprofit organizations in the High Mountains of Sinai Peninsula

3.1 Emanuel Marx's profit maximization theory and the sustainability theory in practice

Since 1970s CE concurrently with the rise of the tourism modern economy, the local community is subjected to an anthropological conceptual analysis. Emanuel Marx emphasized in early 1980s CE on the tendency of the local Bedouin community of South Sinai to balance between profit and security maximization (i.e. profit maximization under socio-ecological and socioeconomic context, while security maximization in a broader context: geography of security and security of geography) (Marx, 1976, 1977, 1980, 1984, 1985, 1987, 1999, 2003, 2004, 2007) (Gradner et al., 2000) (RGS-IBG, 2012). It is the tendency which Smadar Lavie investigated in 1970s-1980s CE as a result of the extended living Bedouin memory about uncertainty (Lavie, 1991). Such an uncertainty is reflected in the six major economical transition phases in the history of the mountain range. Three different states governed the area-region in 20th century CE due to the unstable geopolitical context of the Middle East (i.e. Imperial Britain, Arab Republic of Egypt and the newly born State of Israel):

- a Emergence of the early western travelers to the Sinai Peninsula in 1336 CE
- b World War I 'WWI' in 1914-1918 CE
- c Six Days War 5th of June 1967 CE
- d Camp David Peace Treaty between Egypt and Israel in 1979 CE
- e Egyptian economical reforms 'privatization' in late 1990s - early 2000s CE
- f European Commission 'South Sinai Regional Development Program - SSRDP' in 2006-2010 CE

g currently, Egyptian National Reforms Revolution of January 25, 2011 CE (Shams, 2010b, 2011c, 2011e, 2012b, 2012c) (Tab. 3)

Table 3 Cause-effect and characteristics of the economical transition phases

Cause of Transition	Effect	Economical Characteristics
<p>Emergence of the early western travelers to the Sinai Peninsula in 1336 CE</p> <p><i>'Natural development cause'</i></p>	<p>Establishment of the full raw economical profile of the Gebaliya tribe</p>	<p><i>Main economy</i></p> <ul style="list-style-type: none"> - <u>Transportation</u>: pilgrims and travelers <p><i>Supportive economy</i></p> <ul style="list-style-type: none"> - <u>Mountainous agriculture</u>: orchards' goods (i.e. local consumption + trade) - <u>Herding</u>: seasonal cycle '<i>Arabic: rihla</i>' (i.e. local consumption + trade) - <u>Charcoal</u>: acacia and tamarisk trees (i.e. local consumption + trade) - <u>Hunting</u> (i.e. local consumption)
<p>World War I 'WWI' 1914-1918 CE</p> <p><i>'Geopolitical cause - Military operations'</i></p>	<p>Disturbance of the economical profile of the Gebaliya tribe and the rise of the smuggling activities in 1920s CE</p>	<p><i>Main economy (decline)</i></p> <ul style="list-style-type: none"> - <u>Transportation</u>: declined and limited to the High Mountains of Sinai Peninsula <p><i>Supportive economy (partial local rise)</i></p> <ul style="list-style-type: none"> - <u>Wage labor</u>: mainly in Holy Monastery of St. Catherine; centralized-limited accessibility to the manganese mines via the governmental sheikh (limited) 'the formation of South Sinai mining economical belt, Gulf of Suez' - <u>Mountainous agriculture</u>: local consumption; 100

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		<p>families worked 300 orchards (rise)</p> <ul style="list-style-type: none"> - <u>Herding</u>: local consumption; sheep and goats, meat and milk (rise) - <u>Charcoal</u>: local consumption (decline) - <u>Hunting</u>: local 'Fox, Hyrax, Hare, Hyena, Ibex, Cat Felis, Wolf, Feral Donkey and Leopard' (low profile) <p style="text-align: center;"><i>Illegal economy</i></p> <ul style="list-style-type: none"> - <u>Smuggling</u>: Turkish, Lebanese and Syrian opium via North Sinai
<p>Six Days War 5th of June 1967 CE</p> <p>'Geopolitical cause - Military operations'</p>	<p>Modern market economy 'tourism'</p>	<p style="text-align: center;"><i>Main economy (rise)</i></p> <ul style="list-style-type: none"> - <u>Transportation</u> → <u>tourism</u>: Eco-cultural tourism in the High Mountains of Sinai Peninsula 'the formation of South Sinai tourism economical belt, St. Catherine - Gulf of Aqaba' - <u>Wage labor</u>: oilfields, civilian-military construction, mechanics and tourism services 'decentralized-sole involvement' <p style="text-align: center;"><i>Supportive economy (decline)</i></p> <ul style="list-style-type: none"> - <u>Mountainous agriculture</u>: local consumption; 30-40 families worked 120 orchards (decline) - <u>Herding</u>: local consumption; sheep and goats, meat and milk (decline) - <u>Charcoal</u>: local consumption (limited by law) - <u>Hunting</u> (prohibited) <p style="text-align: center;"><i>Illegal economy (relatively considerable)</i></p>

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<p>Camp David Peace Treaty between Egypt and Israel in 1979 CE¹</p> <p><i>'Geo-political cause - Peace treaty'</i></p>	<p>High Mountains of Sinai Peninsula as a part of South Sinai tourism economical-belt 'mass tourism'</p>	<p>- <u>Smuggling</u>: the Israeli military administration moderates the smuggling activities against the Nile Valley (regulated)</p> <p><i>Main economy (decline)</i></p> <p>- <u>Tourism</u>: Eco-cultural tourism in the High Mountains of Sinai Peninsula</p> <p>- <u>Wage labor</u>: oilfields, civilian-military construction, mechanics and tourism</p> <p><i>Supportive economy (rise)</i></p> <p>- <u>Mountainous agriculture</u>: local consumption (rise)</p> <p>- <u>Herding</u>: local consumption; sheep and goats, meat and milk (rise)</p> <p>- <u>Charcoal</u>: local consumption (limited)</p> <p>- <u>Hunting</u> (limited-prohibited)</p> <p><i>Illegal economy (rise)</i></p> <p>- <u>Smuggling</u>: the activities back in action (prohibited)</p>
<p>Egyptian economical reform 'privatization' in late 1990s- early 2000s CE</p> <p><i>'Economical cause'</i></p>	<p>International organizations' funds for natural-cultural conservation of the High Mountains and the preparation for a significant EU Commission fund</p>	<p><i>Main economy (significant rise)</i></p> <p>- <u>Mass tourism</u>: Eco-cultural tourism in the High Mountains of Sinai Peninsula</p> <p>- <u>Wage labor</u>: tourism services and natural-cultural resources conservation</p> <p><i>Supportive economy (decline)</i></p>

¹ "The settlement Situation in Sinai: transitional settlement....examples....St. Catherine....Characterized by a transitional economy that is expected to revolve around planned establishments and activities (industry, tourism, government); a predictable, settled population as a result of planned development; and a spatially consolidated built-up area around or adjacent to major economic activities." (Dames & Moore, 1979-1985)

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		<ul style="list-style-type: none"> - <u>Mountainous agriculture</u>: local consumption; 20 families worked a number of orchards (decline) - <u>Herding</u>: local consumption; sheep and goats, meat and milk (decline) - <u>Charcoal</u>: local consumption (limited by law) - <u>Hunting</u> (prohibited) <li style="text-align: center;"><i>Illegal economy (relatively considerable)</i> - <u>Smuggling</u> (prohibited)
<p style="text-align: center;">European Commission 'South Sinai Regional Development Program - SSRDP' in 2006-2010 CE</p> <p style="text-align: center;"><i>'Economical cause'</i></p>	<p style="text-align: center;">First significant fund in order to support local business (i.e. individual funds for business owners 'Gebaliya Bedouins')</p>	<p><u>Main economical activity</u>:</p> <ul style="list-style-type: none"> - Eco-cultural tourism* - Tourism services and natural-cultural resources conservation <p><u>Rising supportive-economical activity</u>:</p> <ul style="list-style-type: none"> - Medicinal plants** - Handicrafts*** <p><u>Traditional supportive-economical activity</u>:</p> <ul style="list-style-type: none"> - Mountainous agriculture****(i.e. constant at low level) - Herding (i.e. constant at low level) - Charcoal production (i.e. very limited) <p><u>Extinct traditional supportive-economical activity</u>:</p> <ul style="list-style-type: none"> - Hunting (prohibited by law) <p><u>Illegal supportive economical activity</u>:</p> <ul style="list-style-type: none"> - Smuggling (prohibited by law)

Since the economical transition phase (e), the profit maximization theory is a rising and dominating feature. Two main factors lead to the profit maximization behavior:

- 1 the lack of trust as a social capital in the current and future governance measures towards the maximization of final beneficiaries (i.e. laws, regulations and policies)
- 2 the imposed geopolitical role of Sinai Peninsula in warfare and peace as a transitional geography (Shams, 2010b)

It is characterized by a tendency towards a relatively instant benefit compared to the long-term sustainable ones. Concurrently with the rise of the sustainability question in the Arab Republic of Egypt under Western incentives, Joseph J. Hobbs investigated the sustainability option prior and upon the establishment of St. Catherine Natural Protectorate in 1996 CE (Hobbs, 1995, 1996, 1998) (Hobbs et al., 1998). Due to the emergence of the protectorate, the profit maximization theory relatively preserved a low profile on the community level in 1996-2003 CE, in favor of the early success in reaching the largest number of final beneficiaries (ICOMOS, 2002) (UNDP, 2002) (PAMU, 2003) (UNESCO, 2008). Paradoxically, it was a social equality approach in a state on the way of un-transparent application of privatization policies, characterized by social polarization (Kambhampati, 2004) (Shams, 2011e). Since 2003 CE, concurrently with the decline of the socio-ecological and socioeconomic activities of the protectorate, the profit maximization theory dominated the development scene once again. After the delivery of the protectorate to the sole management of the Egyptian Government (i.e. initial status: European Commission and Egyptian Government joint-management), the neo under-funded status is the result of a recognizable misconduct (Grainger et al., 1998) (Grainger, 2003) (Grainger et al., 2008). There is no doubt that the domination of profit maximization is multiplied during the economical transition phase (f) due to the newly intended European Commission fund to the for-profit organizations (Shams, 2011e). Those organizations were selected relative to their impact on the largest number of final beneficiaries (SSRDP, 2006). Although a considerable sum of the fund is intended to the nonprofit organizations and infrastructure, the majority of the Bedouins highly regarded the role of the European Commission fund in maximizing the profits of the for-profit organizations. In other words, it was relatively regarded as

public funds for private sector, not for public benefit (Shams, 2011c, 2011e), raising a core question about the future of sustainability in practice, subjected to Emanuel Marx's profit maximization theory.

3.2 From the Sinai Peninsula Research to the quantification model

Sinai Peninsula Research 2000-2013 CE is a private survey and documentation research initiative via a series of seventeen expeditions in the High Mountains of Sinai Peninsula (i.e. Phase I '2000-2008': August 2000, July 2001, February 2002, June 2002, September 2002, February 2003, June 2003, September 2003, February 2004, August 2004, January 2005, June 2005, January 2006, July 2006, February 2007, April 2007, and September 2007 CE); in addition to an extensive office-based research work (i.e. 2000+ multidisciplinary Sinaitic scientific references). The master target of 'Phase I' was the establishment of extensive geo-based datasets:

- 1 geographical (i.e. interface-analysis tool), linking and showing the relation between all different datasets
- 2 environmental (i.e. constraints), indicating the maximum sustainable carrying capacity of the target area-region of interest
- 3 development and conservation (i.e. socioeconomic aspects), acting as the master-target of the model
- 4 historical; archaeological; anthropological (i.e. timeline issues of interest), providing mass multidisciplinary data about structural development of the area-region of interest
- 5 industrial and system engineering methodology; techniques; tools (i.e. analysis-modeling), in order to address the relation between the area-region of interest as a system in terms of inputs and outputs; transformational and transitional activities.

The Tur Sina Map 'TSM' and the Sinai Peninsula Map 'SPM' (i.e. 6,825 named and coded items) are the major outcomes of 'Phase I', both mapping the inter-impacting relation between physical geography, geology and environment; history, archeology and anthropology; and socioeconomic sustainable development. Since March 2010 (Phase II '2010-2013': analysis phase), Sinai Peninsula Research 2000-2013 CE is a scientific partner in SinaiAlps project *'Integrated Cluster of Centralized*

Rural-Urban Nano-economies in the High Mountains of Sinai Peninsula (Middle East) and Alto Adige-Südtirol (Alps)’, supervised and sponsored by IMT Institute for Advanced Studies ‘Institutions, Markets, Technologies’; scientifically in collaboration with the European Research Academy ‘EURAC’, Institute for Alpine Environment ‘AlpEnv’, towards a global perspective (Shams, 2011e).

In late 19th-20th century CE, globally and consecutively, the world’s mountainous communities established permanent rural and urban settlements in the low-elevated valleys and plains (i.e. economic-based migration patterns); relatively abandoning the traditional highland patterns and establishing modern socioeconomically feasible ones (i.e. mass urbanization process). Accordingly and simultaneously to Marx’s profit maximization theory, there is a necessity to develop a model in order to address the interest of a local community (i.e. issues of interest); to measure the weight of importance of these issues for a target-community; to measure the relation between nonprofit/for-profit organizations with the issues of interest, while evaluating the nonprofit/for-profit organizations via a set of indicators-indexes of efficiency; all under a timeline pattern, showing the progress regarding the issues of interest under different administrations. It is multidisciplinary model founded on different aspects, providing a tool and a technique for individuals/groups and nonprofit/for-profit organizations which enables two main issues: first, compliance of local community needs; second, efficiency of nonprofit/for-profit organizations in fulfilling local community needs; both in the light of socioeconomic sustainable development and economic conservation of cultural-natural resources. The target-group(s) of interest which would utilize-stake such a model could be prioritized according to the direct and indirect impact-use of the model as follows:

- 1 local-regional governance (i.e. micro/macro levels)
- 2 central government
- 3 international natural-cultural resources conservation/
socioeconomic development organizations ‘development and
conservation funds’
- 4 nonprofit organizations; universities; research institutes
- 5 individual researchers
- 6 for-profit organizations

It is a full-scale sustainability model in practice which is subjected to dozens of variables in an era of an increasing uncertainty. These variables in many cases are immeasurable, being evaluated according to qualitative judgmental techniques and tools, leaving the commonly used methodologies quite open towards questioning their reliability in addressing, analyzing and modeling the whole natural-cultural resources conservation and socioeconomic development system (i.e. micro rural-urban area-region of interest).

3.3 Criteria of selection

On the other hand, the scale of the study area-region matters; it is a matter of full-scale realization of the related past and present aspects, conducted from the previously mentioned datasets. In other words, the studied area-region of interest acts as a system; the selection of the geographical unit which represents the system is crucial for a higher accuracy and reliability of the model. The area-region of interest should represent the following criteria:

- 1 a very well identified physical-socioeconomic environment
- 2 a theme of isolation, concurrently with a potential regional role
- 3 a potential natural-cultural context
- 4 a potential area-region of interest for different stakeholders
- 5 a relatively studied area-region of interest
- 6 a mixed rural-urban context
- 7 undergone socioeconomic transition phases under different administrations

The previously mentioned criteria guarantee the feasibility of applying the end-results on a global level in similar area(s)-region(s) of interest due to the complexity and potentiality of the selected area-region (i.e. high standard approach).

3.3.1 A very well identified physical-socioeconomic environment

The mountain range 'High Mountains of Sinai Peninsula' towers the vicinity of South Sinai, extended over an area of a maximum length of

45km long and maximum width of 17.5km wide, ranging between an elevation of 950m ASL (Abu Gedr Area: W. Mi'r, W. El Qsuba and W. El Kharita junction) and 2642m ASL (G. Katharina), as the High Mountains of Sinai Peninsula is topographically identified by sharp landmarks 'mountain masses' which form a natural border, isolating the mountain range from the surrounding low elevated valleys (i.e. anti-clockwise from the northern most mountain mass: G. Abu Nasra 1670m ASL, G. El Banat 1780m ASL, G. Ma'enat 1850m ASL, G. Zibb Rubi' 1900m ASL, G. Hagig 1782m ASL, G. Haweiti 1851m ASL, G. Tarbush 2083m ASL, G. El Ahmar El Gharbi (Hameda-Zatera) 1876m ASL, G. Madsus 2023m ASL, G. Muqassab (Ilti) 1879m ASL, G. Giddat El Ila 2207m ASL, G. Umm Shoumar 2586m ASL, G. Umm Taratab 2338m ASL, G. Rimhan 2413m ASL, G. Thiman 2038m ASL, G. Thabt 2438m ASL, G. Tallat El Gamal 1984m ASL, G. Sheikh 'Arab 2190m ASL, G. Nakhla (Heshayeh) 2037m ASL, G. Umm A'lawi 2121m ASL, G. Ghabghab 1963m ASL and G. Hamami 1558m ASL) (Shams, 2011e) (Fig. 49-56).

On the other hand, the local community of the High Mountains of Sinai Peninsula is a relatively isolated Bedouin community in central South Sinai which is demographically composed of two Bedouin tribes and Nile Valley citizens:

- 1 Gebaliya tribe in the northern half (i.e. core-demographic component)
- 2 Awlad S'aed tribe which shares the Gebaliya tribe some areas in the northern half and inhabits the southern half

Currently, the nano-economical activities in the mountain range (i.e. micro-economy) are classified into the previously mentioned (Tab. 3). As a result, the geo-model identifies specific nano-economical activities within the mountain range (i.e. extent of activities) due to the constraints enforced by the natural-cultural context, as the socioeconomic context is precisely defined under local terms (i.e. economical activities, migration patterns, tribal law, traditions...etc.) and inter-impacted by specific regional elements and factors (i.e. setting within regional economical-belts, regional demographic components, regional governance, regional natural-cultural resources conservation policies, civil law...etc.).

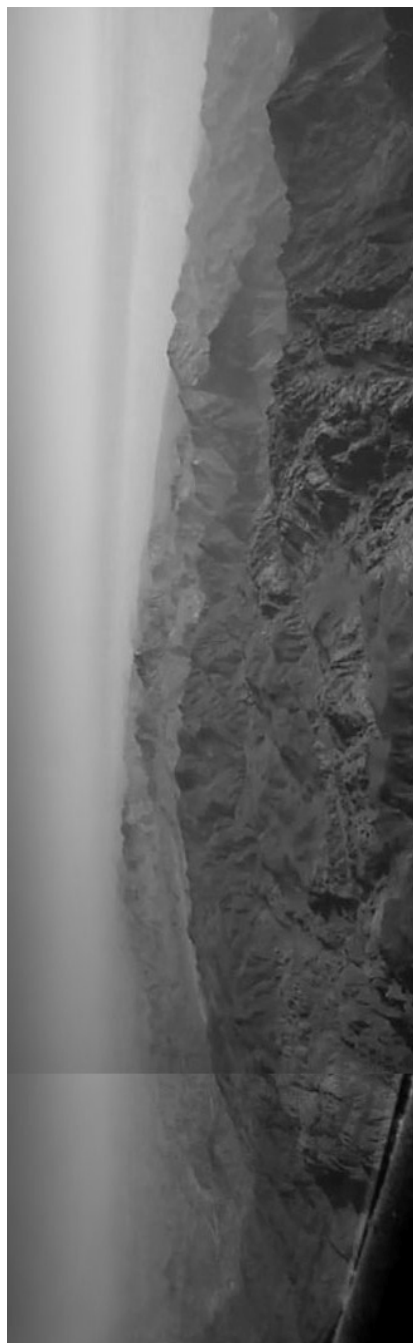


Figure 49 The High Mountains of Sinai Peninsula 'Tur Sina' Aerial view, flying over the northern half & looking south



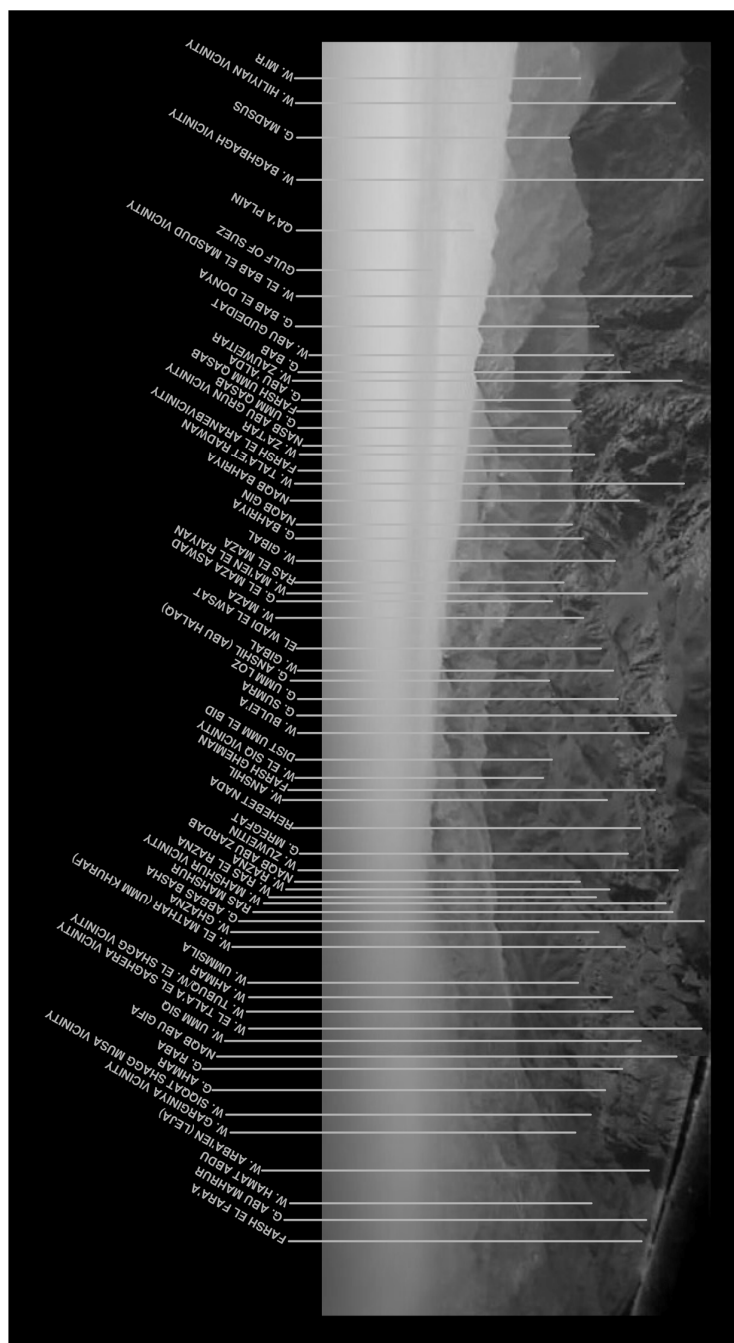
Figure 50 The High Mountains of Sinai Peninsula 'Tur Sina' Aerial view, flying to the north of the middle mountain range & looking south



Figure 51 The High Mountains of Sinai Peninsula 'Tur Sina' Aerial view, flying over the middle mountain range & looking south



Figure 52 The High Mountains of Sinai Peninsula 'Tur Sina' Aerial view, flying over the southern half & looking south



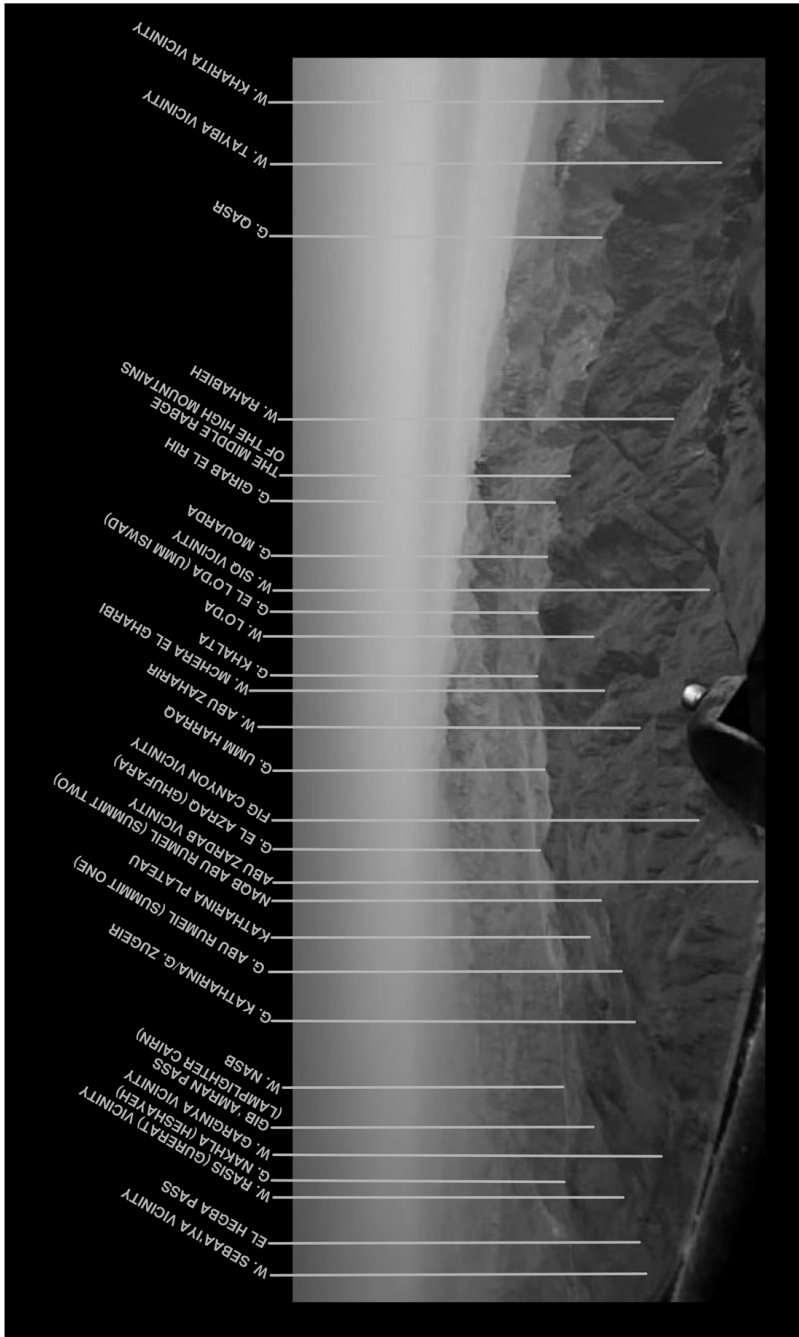


Figure 54 The High Mountains of Sinai Peninsula 'Tur Sina' Aerial view, flying to the north of the middle mountain range & looking south

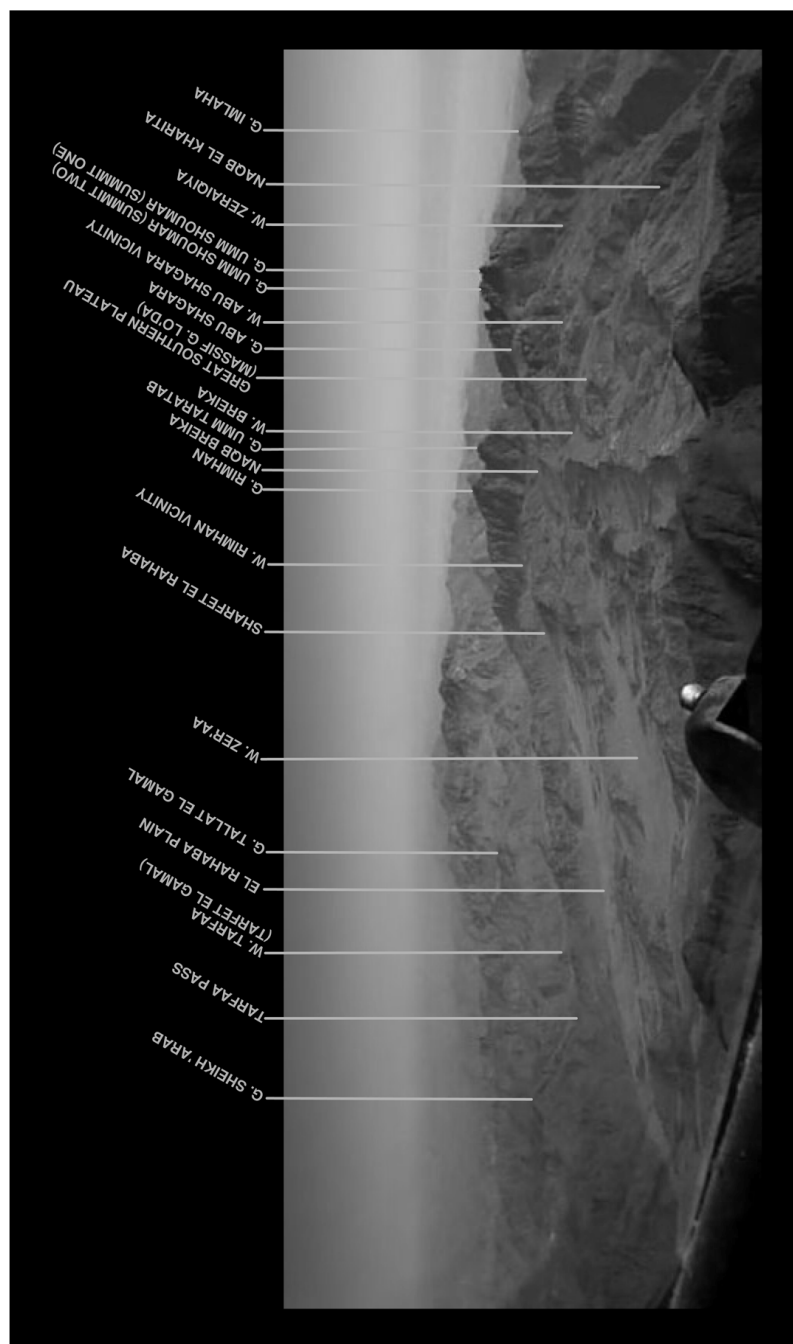


Figure 55 The High Mountains of Sinai Peninsula 'Tur Sina' Aerial view, flying over the middle mountain range & looking south

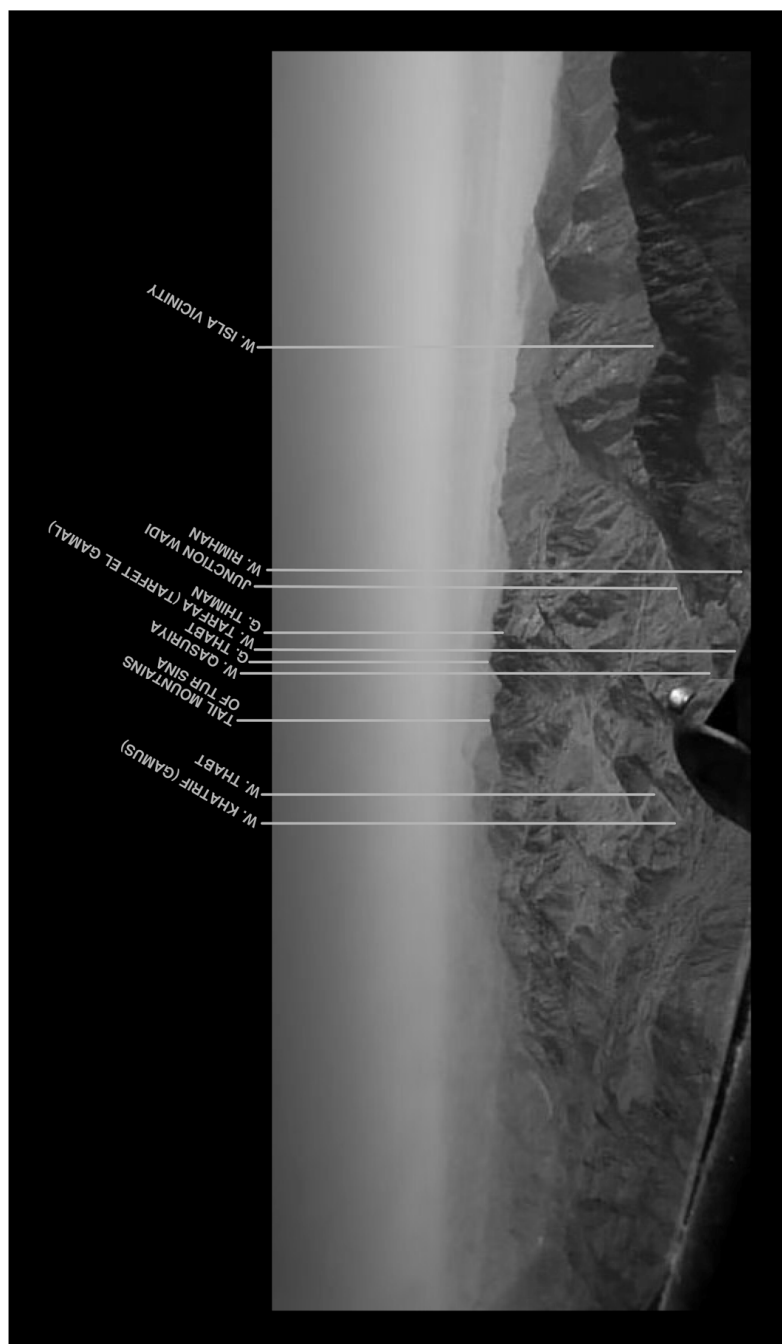


Figure 56 The High Mountains of Sinai Peninsula 'Tur Sina' Aerial view, flying over the southern half & looking south

3.3.2 A theme of isolation, concurrently with a potential regional role

A theme of isolation is a matter of local natural-cultural potentials relevant to the regional context of the study-area of interest. In other words, geographically, the High Mountains of Sinai Peninsula is an isolated mountain range although it plays a historical-present potential role in the vicinity of South Sinai and Sinai Peninsula in general, being the spiritual heart 'religious center' of the peninsula which enriched its cultural context. On the other hand, the topographical features of the mountain range and its geographical setting formed a highly diverse isolated habitat of flora and fauna (i.e. biodiversity); all forming a theme of highly potential cultural-natural isolation.

3.3.3 A potential natural-cultural context

The High Mountains of Sinai Peninsula passed through consecutive phases of human occupation development:

- a Upper Paleolithic - Old Stone Age (40,000 - 17,000 BCE)
- b Epi-Paleolithic (17,000 - 8,500 BCE)
- c Pre-Pottery Neolithic - New Stone Age (8,500 - 6,000 BCE)
- d Pottery Neolithic (6,000 - 4,700 BCE)
- e Chalcolithic - Copper Age (4,700 - 3,150 BCE)
- f Bronze Age I-II (3150/2925 BCE) (Pritchard,1998)–transit vicinity 'Mount Sinai/Biblical Horeb' for the Sons of Israel (1575- 1215 BCE)
- g Nabateans (1st century - 106 CE)
- h Roman-Byzantine monks since 3rd century CE
- i Gebaliya tribe since 6th century CE (Dahari, 2000)
- j Nile Valley citizens since 1980s CE; in addition to the transitional military authorities of the Ottoman-Turk (19th century CE), British (late 19th century - first half of the 20th century CE) and Israeli (June 1967 - November 1979 CE) (Shams, 2011e)

Such topographical features and geographical setting is a habitat for a highly diverse flora and fauna, forming an ecosystem which represents the core vicinity of St. Catherine Natural Protectorate (i.e.

the high mountains and the surrounding areas are a habitat of 512 plant species, including 316 recorded ones; 25 mammal(s) species; 50 resident breeding bird(s) species and 100 species of migrating ones; 36 reptile(s) species; while insects are the least studied with an exception to the butterflies, as more than 40 butterfly(ies) species are recorded) (PAMU, 2003).

3.3.4 A potential area-region of interest for different stakeholders

Globally, project stakeholders are mainly classified into the following sets:

- a donors, investors and funders (i.e. international-national)
- b project managers and implementers (i.e. international-national; regional-local)
- c beneficiaries (i.e. proximate explicitly-implicitly intended; remote explicitly-implicitly intended) (Bell et al., 2008)

Currently, the stakeholders of the High Mountains of Sinai Peninsula are classified into the following five categories (a-e), excluding their nature-role of being public-private; or being

- 1 nongovernmental organization 'NGO'
- 2 government-organized nongovernmental organization 'GONGO'
- 3 business-organized nongovernmental organization 'BONGO'
- 4 other (Peace Corps, 2009)
- a micro-local stakeholders
- b macro-regional stakeholders
- c national-central stakeholders
- d international-foreign Stakeholders
- e local-nonprofit stakeholders (Tab. 4)

Table 4 Stakeholders of the economical transition phases

Economical Transition Phase	Phase Duration – Stakeholders

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	<p style="text-align: center;"><u>14th-Early 20th century CE</u></p> <p style="text-align: center;"><i>Micro-Local Stakeholders</i></p> <ul style="list-style-type: none"> - Local communities (i.e. Gebaliya and Awlad S'aed tribes) - Other Sinaitic tribes 'Tawara Tribal Alliance' - Holy Monastery of St. Catherine - Pilgrims and travelers 'visitors' <p style="text-align: center;"><i>Macro-Regional Stakeholders</i></p> <ul style="list-style-type: none"> - Mamluks of Egypt - Ottoman Empire 'Turks' - Mohamed Ali's family - Khedive of Egypt Abbas Helmi Basha I
Mid 14 th century CE	
	<p style="text-align: center;"><u>1914-1967 CE</u></p> <p style="text-align: center;"><i>Micro-Local Stakeholders</i></p> <ul style="list-style-type: none"> - Local communities (i.e. Gebaliya and Awlad S'aed tribes) - Other Sinaitic tribes 'Tawara Tribal Alliance' - Holy Monastery of St. Catherine - Pilgrims and travelers 'visitors' - Smugglers - Individual researchers <p style="text-align: center;"><i>Macro-Regional Stakeholders</i></p> <ul style="list-style-type: none"> - British military authority 'British mandate' - Egyptian Ministry of Defense (i.e. former Ministry of War) - Governorate of Sinai Peninsula <p style="text-align: center;"><i>Foreign Stakeholders</i></p> <ul style="list-style-type: none"> - United Nations Relief and Works Agency 'UNRWA' <p><u>Note:</u> possibility of a limited role for other central stakeholders</p>
Post World War I 'WWI' 1914-1918 CE	
Post Six Days War 5 th of June 1967 CE	<p style="text-align: center;"><u>1967-1983 CE</u></p>

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Micro-Local Stakeholders

- Local communities (i.e. Gebaliya and Awlad S'aed tribes)
- Other Sinaitic tribes 'Tawara Tribal Alliance'
- Holy Monastery of St. Catherine
- Tzukei David Field Study Center
- El Melga Ethnographic Museum
- Pilgrims, travelers and tourists 'visitors'
- Owners of tourism accommodation facilities
- Smugglers

Macro-Regional Stakeholders

- Israeli military authority

Foreign Stakeholders

- United States Agency for International Development 'USAID'

Nonprofit Stakeholders

- The Administration of the Development of King Solomon's Wilderness
- Israeli Society for Nature Protection

Note: in addition to other equivalent organizations like the Egyptian ones of the 1983-2010 CE transition phases

1983-Early 2000s CE

Micro-Local Stakeholders

- Local communities (i.e. Gebaliya and Awlad S'aed tribes)
- Other Sinaitic tribes 'Tawara Tribal Alliance'
- Holy Monastery of St. Catherine
- St. Catherine Natural Protectorate 'Egyptian Environmental Affairs Agency'
- City council
- Pilgrims, travelers and tourists 'visitors'

Post Camp David Peace Treaty
between Egypt and Israel
1979 CE

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- Owners of tourism accommodation facilities
- Smugglers
- Individual researcher(s) (e.g. Sinai Peninsula Research 2000-2010 'private research')

Macro-Regional Stakeholders

- South Sinai Governorate (i.e. Quarry Department, License Administration, Environmental Affairs Administration, Health Services Directorate and Veterinary Directorate)
- South Sinai Development and Urbanization Agency 'Ministry of Housing and New Communities'
- Suez Canal University 'in addition to other national and foreign ones'

Central Stakeholders

- Antiquities Department of the Supreme Council for Antiquities 'Ministry of Culture'
- Egyptian General Authority for Mineral Resources 'Ministry of Petroleum'
- Military Intelligence and Border Guards 'Ministry of Defense'
- Tourism Police 'Ministry of Interior/Ministry of Tourism'
- Ministry of Agriculture
- General Organization for Roads and Bridges
- South Sinai Electricity Company
- Tourism companies

Foreign Stakeholders

- United Nations Educational, Scientific and Cultural Organization 'UNESCO'
- United States Agency for International Development 'USAID'
- United Nations Development

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<p>Post European Commission SSRDP 'South Sinai Regional Development Program' 2006-2010 CE</p>	<p>Programme 'UNDP' - European Commission - UK Department for International Development 'DFID'</p> <p><i>Nonprofit Stakeholders</i> - Makhad Trust - St. Catherine Foundation - Medicinal Plants Project</p> <p><i>For-profit Stakeholders</i> - FANSINA</p> <p><u>2010 CE</u></p> <p>Previous transition stakeholders (i.e. 1983-Early 2000s CE) in addition to:</p> <p><i>Nonprofit Stakeholders</i> - Community Foundation for South Sinai - Medicinal Plants Association 'MPA' - Community and Environmental Services Association 'CESA' - Egyptian Earth Construction Association 'EECA' - Jebeliya NGO? - Gabal Mousa NGO - Bedouin Cultural Center</p> <p><i>For-profit Stakeholders</i> - Sheikh Sina - Medicinal Plants - Bedouin Mechanic at Tarfat El Qidarein</p>
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3.3.5 A relatively studied area-region of interest

Hundreds of national-international organizational, institutional and academic studies were published about the study-area of interest (i.e. High Mountains of Sinai Peninsula) and the study-region of interest (i.e. Sinai Peninsula), regarding history, archaeology, anthropology, geography, geology, demography, sociology, economy, ecology,

environment and development...etc. The intended model of interest is based on 811 multinational English references-studies and 73 Arabic references-studies (i.e. the English references are based on more than 1200 older references-studies); all represent more than 90% of the written references-studies about Sinai Peninsula throughout history till 2013 (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a).

3.3.6 A mixed rural-urban context

The study-area of interest is composed of five types of settlements:

- a urban area 'micro-economy center': town of Katharina
- b rural area 'cluster-satellite villages-settlments': No'amana village; Arb'aïen village; Seba'aiya village; Zaytouna village; Abu Zeituna village; Khrazeen village; El Raha village; Abu Sila village; El Sheikh A'wad village
- c temporary settlements: 623 mountainous orchards and 351 agricultural plots are scattered all over the mountain range
- d abandoned settlements 'ancient sites': 73 archeological sites and 54 newly recorded ancient sites scattered all over the mountain range (i.e. the majority are Byzantine monastic settlements)
- e reused abandoned settlements: mixed sites (i.e. temporary-abandoned settlements)

3.3.7 Undergone socioeconomic transition phases under different administrations

The High Mountains of Sinai Peninsula was impacted by several regional-global events which caused its exposure to socioeconomic transition phases under different administrations (Tab. 3 & 4).

3.4 The timeline issues of interest 'status 2010-2013 CE'

There is no doubt that there are several approaches in order to stand on the issues of interest for a local community:

- 1 participatory mapping and modeling
- 2 transect walks and participatory transects

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- 3 seasonal calendars
- 4 activity profiles and daily routines
- 5 timelines
- 6 local histories
- 7 venn diagrams
- 8 wealth ranking
- 9 matrices
- 10 inventory of local management systems and resources
- 11 portraits, profiles, case-studies and stories
- 12 folklore, songs and poetry
- 13 team interactions
- 14 night halt
- 15 survey of villagers attitudes
- 16 intriguing practices and beliefs
- 17 key informant interview
- 18 focus group interview
- 19 community interviews 'local community consultation' (Bell et al., 2008)
- 20 socioeconomic-demographic surveys
- 21 social impact assessments
- 22 interviews with local-regional governance

The complexity of the derivation methods, techniques and tools is determined according to the setting of the area-region of interest under the umbrella of the previously mentioned identification criteria.

A *timeline* is an efficient technique-tool in the determination of the issues of interest for a local heritage-based–relatively small communities–identifying the following:

- 1 full-scale local interest
- 2 development and transformation of interest

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- 3 transition phases (i.e. potential socioeconomic shifts)
- 4 nature-role of stakeholders
- 5 capacity profile of variable elements and factors of the study area-region of interest.

The word *timeline* refers to an extensive chronologically-referenced table with an exclusive full record for all the major and minor events in the area-region of interest (i.e. based on 2000+ multidisciplinary Sinaitic scientific references: history, archaeology, anthropology, geography, geology, demography, sociology, economy, ecology, environment and development...etc.). The events record is sub-classified under keywords, addressing and identifying the *issues of interest* for a local community (i.e. commonly rising and developing issues over a long time span). The *timeline issues of interest* represent an exclusively detailed understanding for human occupation development.

Globally (e.g. Norwich set); the *issues of interest* are classified into three *main sets*:

- 1 environmental protection
- 2 economic development
- 3 social development

Each set is measured by several indicators-indexes which must be customized and modified according to the territorial needs. Regarding the United Kingdom of Great Britain 'UK', the issues of interest are classified into the following sets:

- 1 health
- 2 security
- 3 standard of living
- 4 education
- 5 environment
- 6 culture, recreation and leisure
- 7 housing
- 8 transport/access to goods and services

9 tranquility

10 community spirit (Bell et al., 2008)

According to the United Nations 'UN', the issues of interest are classified into four main sets:

- 1 environmental (i.e. promoting sustainable agriculture and rural development; combating deforestation; conservation of biological diversity; protection of atmosphere; environmentally sound management of biotechnology)
- 2 economic (i.e. changing consumption patterns; financial resources and mechanisms)
- 3 social (i.e. combating poverty; demographic dynamics and sustainability; promoting education, public awareness and training; protecting and promoting human health; promoting sustainable human settlement development)
- 4 institutional (i.e. science for sustainable development; information for decision making; strengthening the role of major groups) (United Nations, 2007) (Bell et al., 2008) (Tab. 5)

Table 5 United Nations 'UN' indicators for sustainable development (UN, 2007)

Theme	Sub-theme	Core indicator	Other indicator
Poverty	Income poverty	Proportion of population living below national poverty line	Proportion of population below \$1 a day
	Income inequality	Ratio of share in national income of highest to lowest quintile	
	Sanitation	Proportion of population using an improved sanitation facility	
	Drinking water	Proportion of	

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Governance		population using an improved water source	
	Access to energy	Share of households without electricity or other modern energy services	Percentage of population using solid fuels for cooking
	Living conditions	Proportion of urban population living in slums	
	Corruption	Percentage of population having paid bribes	
	Crime	Number of intentional homicides per 100,000 population	
Health	Mortality	Under-five mortality rate	
		Life expectancy at birth	Healthy life expectancy at birth
	Health care delivery	Percent of population with access to primary health care facilities	Contraceptive prevalence rate
		Immunization against infectious childhood diseases	
	Nutritional status	Nutritional status of children	
	Health status and risks	Morbidity of major diseases	Prevalence of tobacco use

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Education	Education level	such as HIV/AIDS, malaria, tuberculosis	Suicide rate
		Gross intake ratio to last grade of primary education	Lifelong learning
		Net enrolment rate in primary education	
	Literacy	Adult secondary (tertiary) schooling attainment level	
		Adult literacy rate	
Demographics	Population	Population growth rate	Total fertility rate
		Dependency ratio	
	Tourism		Ratio of local residents to tourists in major tourist regions and destinations
Natural hazards	Vulnerability to natural hazards	Percentage of population living in hazard prone areas	
	Disaster preparedness and response		Human and economic loss due to natural disasters
Atmosphere	Climate change	Carbon dioxide emissions	Emissions of greenhouse gases

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Land	Ozone layer depletion	Consumption of ozone depleting substances	
	Air quality	Ambient concentration of air pollutants in urban areas	
	Land use and status		change Land degradation
	Desertification		Land affected by desertification
	Agriculture	Arable and permanent cropland area	Fertilizer use efficiency
			Use of agricultural pesticides
			Area under organic farming
	Forests	Proportion of land area covered by forests	Percent of forest trees damaged by defoliation
			Area of forest under sustainable forest management
	Coastal zone	Percentage of total population living in coastal areas	Bathing water quality
Oceans, seas and coasts	Fisheries	Proportion of fish stocks within safe biological limits	
	Marine environment	Proportion of marine area protected	Marine trophic index

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Freshwater	Water quantity		Area of coral reef ecosystems and percentage live cover
		Proportion of total water resources used	
		Water use intensity by economic activity	
	Water quality	Presence of faecal coliforms in freshwater	Biochemical oxygen demand in water bodies
			Wastewater treatment
Biodiversity	Ecosystem	Proportion of terrestrial area protected, total and by ecological region	Management effectiveness of protected areas
			Area of selected key ecosystems
			Fragmentation of habitats
	Species	Change in threat status of species	Abundance of selected key species
			Abundance of invasive alien species
Economic development	Macroeconomic performance	Gross domestic product (GDP) per capita	Gross saving
		Investment share in GDP	Adjusted net savings as percentage of gross national income (GNI)

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Global economic partnership			Inflation rate
	Sustainable public finance	Debt to GNI ratio	
	Employment	Employment-population ratio	Vulnerable employment
		Labor productivity and unit labor costs	
		Share of women in wage employment in the non-agricultural sector	
	Information and communication technologies	Internet users per 100 population	Fixed telephone lines per 100 population
			Mobile cellular subscribers per 100 population
	Research and development		Gross domestic expenditure on R&D as a percent of GDP
	Tourism	Tourism contribution to GDP	
	Trade	Current account deficit as percentage of GDP	Share of imports from developing countries and from LDCs
			Average tariff barriers imposed on exports from developing countries and LDCs
	External financing	Net Official	Foreign direct

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Consumption and production patterns		Development Assistance (ODA) given or received as a percentage of GNI	investment (FDI) net inflows and net outflows as percentage of GDP
			Remittances as percentage of GNI
	Material consumption	Material intensity of the economy	Domestic material consumption
	Energy use	Annual energy consumption, total and by main user category	Share of renewable energy sources in total energy use
		Intensity of energy use, total and by economic activity	
	Waste generation and management	Generation of hazardous waste	Generation of waste
		Waste treatment and disposal	Management of radioactive waste
	Transportation	Modal split of passenger transportation	Modal split of freight transport
			Energy intensity of transport

Regarding the High Mountains of Sinai Peninsula, the timeline issues of interest involves most of the commonly used approaches in addressing the interest of a local community, as the model is based on mass full-scale multidisciplinary studies. As a result, the timeline addressed 56 issues of interest (i.e. equivalent to the UN sub-themes) which are classified according to the following 10 customized sets (i.e. equivalent to the UN themes) (Tab. 6).

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Table 6 Timeline issues of interest in the High Mountains of Sinai Peninsula

Issue Number 'Code'	Timeline Issue
<i>Environmental - Natural Heritage</i>	
1	Biodiversity
2	Groundwater recharge rate
3	Aesthetics
<i>Migration</i>	
4	Migration patterns
<i>Demographic</i>	
5	Housing
6	Population
7	Monasticism
<i>Economy</i>	
<i>Main economical activity</i>	
8	Eco-cultural tourism
9	Tourism services
10	Natural-cultural resources conservation
11	Tourism accommodation facility
12	Tourism facilities
13	Museum
<i>Rising supportive-economical activity</i>	
14	Medicinal plants
15	Handicrafts
<i>Traditional supportive-economical activity</i>	
16	Mountainous agriculture
17	Herding
18	Charcoal production
<i>Illegal economical activity</i>	
19	Smuggling
20	Economical transition
21	Market
22	Trade
23	Jobs-employment opportunities
<i>Cultural Heritage</i>	
24	Cultural assets preservation state

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Foreign funds

25	United Nations Educational, Scientific and Cultural Organization 'UNESCO'
26	United States Agency for International Development 'USAID'
27	United Nations Development Programme 'UNDP'
28	European Commission
29	UK Department for International Development 'DFID'

Governance

30	Administration
31	Sinai Development Authority
32	Egyptian Ministry of Culture
33	NGO
34	Stakeholders
35	Traditional transportation in remote inaccessible areas
36	Tribal law
37	Law
38	Natural reserve
39	Ownership of land
40	Urban plan
41	Distribution of subsidized goods
42	Agriculture
43	Water
44	Electricity
45	Waste
46	Clinic
47	Hospital
48	South Sinai governor
49	Military service

Geopolitical

50	Western influence
51	Peace treaty

Management and monitoring 'Capacity-building'

52	Education
53	Scientific research
54	Training

Micro value

55	Value of St. Catherine Natural
56	Protectorate Revenue

3.5 Contextual definitions

Each of the 56 issue of interest (i.e. sub-theme) is given a definition which reflects a global and a customized local-regional context.²

3.5.1 Environmental-natural heritage

Complete ecological units that function as natural systems without massive human intervention, including all vegetation, animals, microorganisms, rocks, atmosphere and natural phenomena that occur within their boundaries (Flyvbjerg et al., 2003).

I.e. High Mountains of Sinai Peninsula 'criteria': (i), (ii) & (iii).

- 1 Biodiversity:³ i.e. High Mountains of Sinai Peninsula 'criteria': (iii)
- 2 Groundwater recharge rate:⁴ a number of 58 named-coded water resources in the high mountains: spring (*Arabic: Ein*); waterwell (*Arabic: Bir*); water hole - temporary source (*Arabic: Biyara*); natural water pool (*Arabic: Galt*); natural long narrow water pool (*Arabic: Kharaza*); collected water on a long flat granite surface (*Arabic: Malag*); collected water on narrow rock steps (*Arabic: Moudrgat Myah*); in addition to an approximate number of 974 water resources which are distributed on the mountainous orchards and plots; in 2003-2004 CE, the maximum capacity of groundwater was 700m³/day/city council 'town of Katharina'/4 main water wells; total demand is 1,489m³/day/council (SEAM, 2003-2004)

² It must be highlighted that the Climate Change is a master issue of interest with a negative impact on the majority of the 56 issues of interest, acting as a core factor.

³ "The degree of variation of life forms within a given ecosystem." (Drummond et al., 2001)

⁴ "Volume-rate abstracted from an aquifer in the long term should be less than or equal to the volume-rate that is recharged." (Allison, 1994)

- 3 Aesthetics:⁵ i.e. threats ‘despoliation of the natural landscape’ including urbanization, quarrying, tourism facilities, other commercial activities, pollution, overgrazing...etc. (PAMU, 2003)

3.5.2 Migration

Geographical movements of individuals or groups for the purpose of permanently resettling (Brown et al., 1977).

I.e. High Mountains of Sinai Peninsula ‘criteria’: (iv), (vi) & (vii).

- 4 Migration patterns: there are three main migration patterns which imply to the High Mountains of Sinai Peninsula
- a historical-traditional seasonal herding migration cycle since Chalcolithic [Copper Age] (4,700 - 3,150 BCE) until Six Days War in 1967 CE (Perevolotsky, 1981)
 - b shift from the nomadic lifestyle patterns to rural-urban lifestyle, clustered around the historical-contemporary socioeconomic center of the High Mountains of Sinai Peninsula since 1970s CE (i.e. the Holy Monastery of St. Catherine and Mount Sinai) (Rabinowitz, 1985)
 - c migration of the Nile Valley citizens to the urban center of the high mountains since 1980s CE (i.e. town of Katharina: unstable population of 600 individuals in 2001 CE) (ICOMOS, 2002)

3.5.3 Demographic

Science of human population. Demography represents a fundamental approach to the understanding of human society. Its primary tasks are to ascertain the number of people in a given area, to determine what change that number represents from a previous census, to explain the change, and to estimate the future trends of population changes (Davis, 1976).

I.e. High Mountains of Sinai Peninsula ‘criteria’: (vi) & (vii).

- 5 Housing:⁶ there are three types of dwellings in the mountain range

⁵ “The branch of philosophy that is concerned with the nature of art and the criteria of artistic judgment....the major problem in aesthetics concerns the nature of the beautiful.” (Gilbert et al., 1965)

- a governorate-built houses
- b Bedouin-built houses (i.e. High Mountains of Sinai Peninsula 'criteria': (vi))
- c the Holy Monastery of St. Catherine and monastic dwellings/hermit cells (Dahari, 2000) (i.e. in 2003-2004 CE, 726 dwellings existed in the town of St. Catherine) (SEAM, 2003-2004)
- 6 Population:⁷ i.e. 4,880 individuals in the vicinity of the town of St. Catherine, including rural-urban areas; 75+% is a Bedouin population (SEAM, 2003-2004)
- 7 Monasticism:⁸ i.e. there are 31 monastic settlements, scattered in the vicinity of the Holy Monastery of St. Catherine and Mount Sinai; currently, 25 Greek Orthodox monks are dwelling in the vicinity

3.5.4 Economy

The word economy can be traced back to the Greek word *oikonomos*, 'one who manages a household', derived from *oikos*, 'house', and *nemein*, 'to manage'. From *oikonomos* was derived *oikonomi*, which had not only the sense 'management of a household or family' but also senses such as thrift, direction, administration, arrangement, and public revenue of a state (Mifflin, 2009).

I.e. High Mountains of Sinai Peninsula 'criteria': (iv), (vi) & (vii).

3.5.4.1 Main economical activity

- 8 Eco-cultural tourism: there are two components of tourism in the High Mountains of Sinai Peninsula
- a ecotourism⁹

⁶ "Living accommodations available for the inhabitants of a community." (Jacobs, 1961)

⁷ "Inhabitants of a given area." (Glass et al., 1965)

⁸ "Form of religious life, usually conducted in a community under a common rule. Monastic life is bound by ascetical practices expressed typically in the vows of celibacy, poverty, and obedience, called the evangelical counsels. Monasticism is traditionally of two kinds: the more usual form is known as the coenobitic, and is characterized by a completely communal style of life; the second kind, the eremitic, entails a hermit's life of almost unbroken solitude, and is now rare." (Bouyer, 1955)

b cultural-tourism¹⁰

The two components overlap at specific zones in the High Mountains of Sinai Peninsula, where it is hard to distinguish between the visitors of both components (i.e. Mount Sinai: mixed eco-cultural tourism; average number of visitors 700-1000/day, a max. of 3000 visitors to G. Musa per day; an estimate of 450,000 visitors to G. Musa in 2010 CE), while the two components are easily distinguished in some other zones (i.e. Holy Monastery of St. Catherine - the Holy Valley 'Tuwa': cultural-tourism; the High Mountains of Sinai Peninsula 'Tur Sina': ecotourism).

9 Tourism services:¹¹ regarding the High Mountains of Sinai Peninsula, the following fall under the umbrella 'term' of tourism services

- a local Bedouin transportation (i.e. taxis and minibuses)
- b local Bedouin traditional transportation (i.e. 386 tourism camels in the inaccessible remote areas) (Community and Environmental Services Association 'CESA', 2007)
- c local Bedouin/non-Bedouin shops for traditional products-antiques (i.e. handicrafts, medicinal plants and local rocks)
- d local public washrooms

⁹ "Tourism which is designed to contribute to the protection of the environment or at least minimize damage to it, often involving travel to areas of natural interest in developing countries or participation in environmental project." (HarperCollins, 2003)

¹⁰ "The subset of tourism concerned with a country or region's culture, especially its arts. It generally focuses on traditional communities who have diverse customs, unique form of art and distinct social practices, which basically distinguishes it from other types/forms of culture. Cultural tourism includes tourism in urban areas, particularly historic or large cities and their cultural facilities such as museums and theatres. It can also include tourism in rural areas showcasing the traditions of indigenous cultural communities (i.e. festivals, rituals), and their values and lifestyle. It is generally agreed that cultural tourists spend substantially more than standard tourists do." (OECD, 2009)

¹¹ "Tourism and travel-related services includes services provided by hotels and restaurants (including catering), travel agencies and tour operator services, tourist guide services and other related services." (World Trade Organization, 2010)

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- e cafeterias (i.e. town of Katharina, the Holy Valley, Siqqat Abbas Basha of G. Musa and Farsh Elijaah) and restaurants (i.e. town of Katharina; W. El Sheikh)
- 10 Natural-cultural resources conservation:¹² the authorities in charge of the conservation and preservation of the natural-cultural resources are as follows
 - a natural resources: St. Catherine Natural Protectorate 'Egyptian Environmental Affairs Agency, Ministry of Environment' and South Sinai Governorate Environmental Affairs Administration (i.e. excluding minerals and ores which fall under the authority of South Sinai Governorate Quarry Department and the Egyptian General Authority for Mineral Resources 'Ministry of Petroleum')
 - b cultural resources: Antiquities Department of the Supreme Council for Antiquities 'SCA' 'Ministry of Antiquities' (i.e. not all the 73 archeological sites and the 54 newly recorded ancient sites are registered, and/or subjected to the same level of identification, and/or totally fall under the national protection laws and regulations for archaeological sites) (Atar, 2001) (Shams, 2011e)
- 11 Tourism accommodation facility: there are four types of tourism accommodation facilities in the high Mountains of Sinai Peninsula
 - a hotels
 - Catherine Plaza Hotel
 - El Wady El Mouqudess Hotel
 - St. Catherine Tourist Village
 - Daniella Village
 - W. El Dier Hotel

¹² "The wise use of the earth's resources by humanity. The term conservation came into use in the late 19th century and referred to the management, mainly for economic reasons, of such valuable natural resources as timber, fish, game, topsoil, pastureland, and minerals, and also to the preservation of forests, wildlife, parkland, wilderness, and watershed areas. In recent years the science of ecology has clarified the workings of the biosphere; i.e., the complex interrelationships among humans, other animals, plants, and the physical environment." (Ehrenfeld, 1972)

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- Morgenland Village
- Fairuz Hotel 'former El Raha Tourists Camp'
- b Bedouin camps
 - El Melga Bedouin Camp
 - Fox Camp
 - Moon Camp
- c ecolodges
 - El Karm Ecolodge
 - Sheikh Sina Ecolodge (Shams, 2011e)
- d mountainous orchards, as an unidentified number of Bedouin mountainous orchards accommodate eco-tourists (i.e. an approximate number of 20 orchards)
 - Mohammed Abu Aluan (i.e Farsh Abu A'lwan 'Shamma'a')
 - Oda Mohammed (i.e. W. Shagg)
 - Ramadan Abu Said (i.e. W. Arba'ien 'Leja')
 - Hussein Abu Tarawa (i.e. W. Zuweitin)
 - Saad Mahmoud (i.e. W. Zuweitin)
 - School of Haj Ahmed 'Ahmed Mansour' (i.e. W. Tilah)
 - Saad Salah (i.e. Abu Tuweita)
 - Mohammed Hashash (i.e. W. Zuweitin)
 - Hussein Hashash (i.e. W. El Tala'a El Saghera)
 - Isbail Taya (i.e. W. El Mathar 'Umm Khuraf')
 - Amriya (W. Zuweitin)
 - Farhan and Eid (W. Zuweitin)
 - Farhan Mohammed (i.e. Rehebet Nada)
 - Hussein Salah (W. Buleia'? W. Gibal?)
 - Mohamed and Awad Abu Heb (W. Buleia'? W. Gibal?)

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- Salem Faraj (i.e. W. Gibal)
- Hemeid Sobhy (i.e. W. Gibal)
- Hussein Abu Galaba (i.e. Farsh el Ruman)
- Shob Farhan (i.e. W. Tinya)
- Sharaha Uwad (i.e. W. Tinya)
- Sheikh Ramadan (i.e. El Rahaba Plain) (Matrahazi, 2010) (Hobbs, 1995)

In 2003-2004, there are 775 rooms in the town of St. Catherine (i.e. 236 beds/118 rooms/1 four stars hotel; 1016 beds/490 rooms/4 three stars hotel; 700 beds/167 rooms/7 unclassified; total = 1,952 beds/775 rooms/12 facilities; to be increased to 2,980 as a first stage (SEAM, 2003-2004). In 2000 CE, the average occupancy was 17% (PAMU, 2003).

- 12 Tourism facilities: any other facilities which are not classified under the timeline issues of interest number 9 'tourism services', 11 'tourism accommodation facility' and 13 'museum' (e.g. St. Catherine Protectorate Visitors Center)
- 13 Museum:¹³ there are three types of small museums in the vicinity of the town of St. Catherine
 - a the Museum of the Holy Monastery of St. Catherine (i.e. it is housed inside the walls of the monastery, exhibiting the most precious artifacts of the treasury)
 - manuscripts
 - old prints
 - icons
 - sacred vessels
 - vestments
 - jewelry
 - crosses

¹³ "A building, place, or institution devoted to the acquisition, conservation, study, exhibition, and educational interpretation of objects having scientific, historical, or artistic value." (Mifflin, 2009)

- candlesticks
- bells
- b Fox Camp Bedouin Museum (i.e. local Bedouin private collection of old nomadic artifacts)
- c Bedouin Cultural Center (i.e. under construction ethnographic museum)

3.5.4.2 Rising supportive-economical activity

- 14 Medicinal plants:¹⁴ according to a full-scale fauna survey, 37 species are endemic to St. Catherine Protectorate (i.e. not 19 species which resulted from a previous rapid survey), 4 species of the total number are endemic to Egypt, 213 species were dramatically lost overtime (i.e. plants biodiversity dropped from 512 to 316 species), 102 species are considered medicinal plants, 47 species are considered with potentials as medicinal, 9 species are used in veterinary medicine, 158 are used for other purposes, and 42 species are targeted by the Medicinal Plant Project (UNDP, 2001). Six local Bedouin-groups are involved in the medicinal plants supportive economical activities
- a farmers
 - b collectors (i.e. 42-63, including 40-48 women)
 - c retailers
 - d traditional healers
 - e wholesalers
 - f processors

¹⁴ "Herbalism is a traditional medicinal or folk medicine practice based on the use of plants and plant extracts. Herbalism is also known as botanical medicine, medical herbalism, herbal medicine, herbology, and phytotherapy. Sometimes the scope of herbal medicine is extended to include fungi and bee products, as well as minerals, shells and certain animal parts." (Lai, 2004) (Tapsell, 2006)

- 15 Handicrafts:¹⁵ the following is a list of the handicrafts of the High Mountains of Sinai Peninsula
- a back packs
 - b bead bags
 - c bedspreads
 - d bottle cocers
 - e bracelets
 - f cushions
 - g coasters
 - h computer cover
 - i curtains
 - j dindisha
 - k jewellery bag
 - l key holders
 - m mobile cases (FanSina, 2010)
 - n metal jewellery (Hosny, 2010)

3.5.4.3 Traditional supportive-economical activity

- 16 Mountainous agriculture: there are 623 mountainous orchards (i.e. unidentified number of orchards of a Byzantine origin 'since 4th century CE') and 351 agricultural plots are scattered throughout the mountain range. The main crops till nowadays are Apricot 'sum of two varieties' (first half of June), Apple 'sum of five varieties' (end of June), Peach and Fig (beginning of July), early Grapes (mid July), Fig, Plums 'sum of three varieties' and Grapes 'sum of three varieties' (end of July - beginning of August),

¹⁵ "Bedouin ladies work their magic on colorful thread and beads bringing back to life motifs stored only in the memories of elder tribesmen. Shoulder bags, back packs, cushions, make-up bags, curtains, coasters, quilts, and more - all carry the scents of life known only to old Bedouins, sawn into an attire of modernity, fashion, and functionality, much suitable for our present day." (FanSina, 2010)

Almonds 'sum of two varieties', Pomegranates and Apples 'sum of five varieties' (August), Pear 'sum of 6 varieties' (end of August), Quince (September), Red Grapes and winter Apples 'sum of five varieties' (October), and winter Pear (end of October and beginning of November). In 1970s CE, 50% of the orchards grew seasonal vegetables and other crops such as Tomatoes, Tobacco, Pumpkin, Mulukhiah, Rijlah, Watermelon, Onion, Eggplant, Fava Bean, String Bean, Cantaloupe, Red Pepper, Mallow, Basil, Purslane, Spearmint, Rosemary, Prunes, Quince, Zucchini, Sorghum, Guava, Carob, Orange, Lemon, Olive, Date, Wheat, Corn and Walnut; in addition to Avocado, Aubergine, Jujube, Courgette, Mulberry, Alfalfa, Okra, Lettuce, Parsley, Pea, Pepper, Cress, Rocket and Spinach (Perevolotsky, 1981) (Hobbs, 1995) (Zalat et al. 2008) (Shams, 2010a, 2011e) Currently, 20 families cultivate a number of orchards (Hobbs, 1995) (i.e. check timeline issue of interest number 11 'Tourism accommodation facility')

- 17 Herding:¹⁶ an average number of livestock/household is 4-8 sheep and 5-10 goats, producing meat and milk for local consumption) (SEAM, 2003-2004); no detailed livestock statistics is available about the High Mountains of Sinai Peninsula, town of Katharina and surrounding 29 settlements (i.e. the 29 satellite settlements within the municipality, not just the ones in the High Mountains); other source(s): 356 camels '386 tourism camels?'; 1,348 sheep; 2,866 goats (i.e. the geographical representation is unidentified) (Community and Environmental Services Association 'CESA', 2007)
- 18 Charcoal production:¹⁷ it is produced at the low elevated valleys around the perimeter of the High Mountains of Sinai Peninsula (i.e. lower than 950m ASL) from acacia and tamarisk trees

¹⁶ "A group of cattle or other domestic animals of a single kind kept together for a specific purpose." (Mifflin, 2009)

¹⁷ "Charcoal is the dark grey residue consisting of impure carbon obtained by removing water and other volatile constituents from animal and vegetation substances. Charcoal is usually produced by slow pyrolysis, the heating of wood, sugar, bone char, or other substances in the absence of oxygen. The resulting soft, brittle, lightweight, black, porous material resembles coal and is 50% to 95% carbon." (Food and Agriculture Organization 'FAO', 1983)

3.5.4.4 Illegal economical activity

- 19 Smuggling:¹⁸ there are no official published records about the smuggling activities in the High Mountains of Sinai Peninsula, with an exception of few scholarly and public accounts which refer the smuggling activities to the remote areas and the southern portion of the mountain range (Lavie, 1991) (Hobbs, 1996, 1998) (Marx, 2003) (Shezaf, 2004)

3.5.4.5 Other aspects on the economical activities

- 20 Economical transition:¹⁹ i.e. High Mountains of Sinai Peninsula 'criteria': (vii); check cause-effect-characteristics of the economical transition phases (Tab. 3); check stakeholders of the economical transition phases (Tab. 4); check SWOT analysis for the economical transition phases (Tab. 10)
- 21 Market:²⁰ there are two main markets for the commodities and services of the mountain range
- a central-national/global-international market (i.e. modern market economy for the main economical activity and rising supportive-economical activity 'limited')
 - b traditional small-scale market (i.e. local 'town of Katharina' and regional 'South Sinai' market(s) for the rising supportive-economical activity and traditional supportive-economical activity)
- 22 Trade:²¹ it is basically linked with the traditional small-scale market (i.e. local 'town of Katharina' and regional 'South Sinai' market(s) for the traditional supportive-economical activity)

¹⁸ "The clandestine transportation of goods or persons past a point where prohibited, such as out of a building, into a prison, or across an international border, in violation of applicable laws or other regulations. There are various motivations to smuggle. These include the participation in illegal trade, such as drugs, illegal immigration or emigration, tax evasion, providing contraband to a prison inmate, or the theft of the items being smuggled." (Gras, 1918)

¹⁹ "Passage of economy from one form, state, style, or place to another." (Mifflin, 2009)

²⁰ "A public gathering held for buying and selling merchandise; the business of buying and selling a specified commodity; a geographic region considered as a place for sales." (Mifflin, 2009)

- 23 Jobs-employment opportunities:²² the majority of the population of the High Mountains of Sinai Peninsula is involved in the main economical activity (i.e. lack of solid-official published records for the number of present-future jobs-employment opportunity/economical activity)

3.5.5 Cultural heritage

The legacy of physical artifacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations. Often though, what is considered cultural heritage by one generation may be rejected by the next generation, only to be revived by a succeeding generation" (Tanselle, 1998); "tangible cultural heritage: movable cultural heritage 'paintings, sculptures, coins, manuscripts...etc.'; immovable cultural heritage 'monuments, archaeological sites...etc.'; underwater cultural heritage 'shipwrecks, underwater ruins and cities...etc.'; Intangible cultural heritage: oral traditions, performing arts, rituals...etc.; natural heritage: natural sites with cultural aspects such as cultural landscapes, physical, biological or geological formations...etc.; Heritage in the event of armed conflict (UNESCO, 2008).

I.e. High Mountains of Sinai Peninsula 'criteria': (iii).

- 24 Cultural assets preservation state:²³ considering the model, only the tangible cultural heritage represented in immovable physical artifacts fall under the umbrella of this term (i.e. monuments, archaeological sites...etc.)

3.5.6 International-foreign funds

I.e. High Mountains of Sinai Peninsula 'criteria': (iv). International source of financial supply and technical support 'advisory organizations' for natural-cultural resources conservation and

²¹ "Transaction; an exchange of one thing for another; the business of buying and selling commodities; the act or an instance of buying or selling." (Mifflin, 2009)

²² "The percentage or number of people gainfully employed." (Mifflin, 2009)

²³ "To keep in perfect or unaltered condition; maintain unchanged." (Mifflin, 2009)

socioeconomic sustainable development projects in the High Mountains of Sinai Peninsula.

- 25 United Nations Educational, Scientific and Cultural Organization 'UNESCO':²⁴ in 2002 CE, the northern half of the High Mountains of Sinai Peninsula was declared as the World Heritage Site no.954 (i.e. surface area is 595.87-641km²), based on the natural-cultural conservation policy of St. Catherine Natural Protectorate (i.e. initial operation phase in 1996-2001 CE)
- 26 United States Agency for International Development 'USAID':²⁵ in 1981 CE, 17 projects were proposed by the USAID under the Sinai Development Study 'Egyptian Ministry of Development - Dames & Moore', to be executed in the vicinity of the High Mountains of Sinai Peninsula (Tab. 1)
- 27 United Nations Development Programme 'UNDP':²⁶ in 2002 CE, in collaboration with Global Environmental Facility 'GEF' and Gesellschaft für Technische Zusammenarbeit 'GTZ/EU', the UNDP initiated the Medicinal Plants Conservation Project 'MPCP' (i.e.

²⁴ "UNESCO works to create the conditions for dialogue among civilizations, cultures and peoples, based upon respect for commonly shared values. It is through this dialogue that the world can achieve global visions of sustainable development encompassing observance of human rights, mutual respect and the alleviation of poverty, all of which are at the heart of UNESCO'S mission and activities. The broad goals and concrete objectives of the international community—as set out in the internationally agreed development goals, including the Millennium Development Goals (MDGs)—underpin all UNESCO's strategies and activities. Thus UNESCO's unique competencies in education, the sciences, culture and communication and information contribute towards the realization of those goals." (UNESCO, 2010)

²⁵ "USAID is an independent federal government agency that receives overall foreign policy guidance from the Secretary of State. Our Work supports long-term and equitable economic growth and advances U.S. foreign policy objectives by supporting: economic growth, agriculture and trade; global health; and, democracy, conflict prevention and humanitarian assistance." (USAID, 2010)

²⁶ "UNDP is the UN's global development network, an organization advocating for change and connecting countries to knowledge, experience and resources to help people build a better life. We are on the ground in 166 countries, working with them on their own solutions to global and national development challenges. As they develop local capacity, they draw on the people of UNDP and our wide range of partners." (UNDP, 2010)

Egypt-Conservation and Sustainable Use of Medicinal Plants in Arid and Semi-Arid Ecosystems; Tab. 17)

- 28 European Commission:²⁷ in 1995 under the Regional Economic Development Working Group 'REDWG', the European Commission sponsored the tourism-development scheme TEAM 'Taba-Eilat-Aqaba Macro area' (i.e. the mountain range is located within South Sinai tourism economical belt) (Hobbs, 1996); in 1996 under a European Commission fund, the initial operation phase of St. Catherine Natural Protectorate was put into action; in 2003-2005, a series of interdisciplinary studies were released under EU-SEAM 'Environmental Assessment and Management Programme' (i.e. a South Sinai update for the USAID 'Dames & Moore' Sinai Development Study); in 2006, 16 projects were funded by the European Commission in the High Mountains of Sinai Peninsula under the South Sinai Regional Development Program 'SSRDP' (Tab. 16)
- 29 UK Department for International Development 'DFID':²⁸ in 2003-2004, DFID contributed in South Sinai Environmental Assessment and Management Programme 'SEAM' (Tab. 1)

3.5.7 Governance

Governance relates to decisions that define expectations, grant power, or verify performance. It consists either of a separate process or of a specific part of management or leadership processes. Sometimes people set up a government to administer these processes and systems (World Bank, 1991).

²⁷ "The mission of the European Commission is to promote the general interest of the European Union. It does so by participating in the decision-making process, in particular by presenting proposals for European law, by overseeing the correct implementation of the Treaties and European law, and by carrying out common policies and managing funds." (European Commission, 2007)

²⁸ "DFID is the part of the UK government that manages Britain's aid to poor countries and works to get rid of extreme poverty. DFID set out to make global development a national priority and promote it to audiences in the UK and overseas, while fostering a new 'aid relationship' with governments of developing countries." (DFID, 2010)

I.e. High Mountains of Sinai Peninsula 'criteria': (iv) & (vii). The mountain range is subjected to three levels of governance:

- a local governance: town of Katharina
 - b regional governance: South Sinai Governorate
 - c central governance: Egyptian government in Cairo (i.e. check Ch. 1). Regarding the local community of the High Mountains of Sinai Peninsula, all the issues of interest which fall under the umbrella of governance are generated and implemented by the Egyptian civil administration since 1980s CE, as those issues of interest proportionally coexist with the Egyptian civil administration
- 30 Administration:²⁹ the local governance level (i.e. town of Katharina 'municipality') is the executive branch of the Egyptian government in the High Mountains of Sinai Peninsula
- 31 Sinai Development Authority: i.e. High Mountains of Sinai Peninsula 'criteria': (iv). It is a regional national-domestic development mediator among different groups of stakeholders
- 32 Egyptian Ministry of Culture: it is a central national-domestic cultural institution being permanently represented by the regional antiquities department of the Supreme Council for Antiquities 'SCA' (i.e. excavation/conservation-preservation; check timeline issues of interest numbers 10 'Natural-cultural resources conservation' and 24 'Cultural assets preservation state')
- 33 NGO:³⁰ i.e. High Mountains of Sinai Peninsula 'criteria': (iv) (Tab. 15); lack of solid classification due to partial irrelevance of the nature and role of the NGOs to the declared national and international registration status and regulations

²⁹ "The act or process of administering, especially the management of a government or large institution; the activity of a government or state in the exercise of its powers and duties; the executive branch of a government." (Mifflin, 2009)

³⁰ "Legally constituted organization created by private persons or organizations with no participation or representation of any government. In the cases in which NGOs are funded totally or partially by governments, the NGO maintains its non-governmental status insofar as it excludes government representatives from membership in the organization." (Anheier et al., 2001)

- 34 Stakeholders:³¹ i.e. High Mountains of Sinai Peninsula 'criteria': (iv) (Tab. 4). Considering the mountain range, generally but not strictly, the public sector represents the local-regional authority and/or central government, the private sector represents the for-profit organizations, and the NGOs represent the nonprofit organizations
- 35 Traditional transportation in remote inaccessible areas: an approximate number of 400 camels serve the remote inaccessible areas for domestic-local Bedouin daily life activities and/or domestic-local/regional eco-cultural tourism purposes
- 36 Tribal law:³² the Sinaitic tribal law controls the interrelation between the individuals of the same clan-tribe and their relation with other tribes. It is based on the legal responsibility of the tribe, clan or family, not on the direct legal responsibility of an individual (Ahmed, 2004). The Sinaitic tribal law also deals with the conservation and use of tribal natural resources in case of a single tribe is the sole economical beneficiary in its own territory, and/or it deals with intertribal interest in shared territories (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a)
- 37 Law:³³ considering the High Mountains of Sinai Peninsula, usually but not strictly, the law is being applied and enforced by the governing authority(ies) in order to regulate the relation between the government and the Nile Valley citizens on one hand, and the local Bedouin community on the other hand (i.e. although there are some mixed legal cases which include two or more of the three main social components of the town of Katharina
- a local Bedouin community

³¹ "A person, group, organization, or system who/that affects or can be affected by an organization's actions." (Freeman, 1983)

³² "Refers to the inherent authority of indigenous tribes to govern themselves." (Macklem, 1993)

³³ "A rule of conduct or procedure established by custom, agreement, or authority; a rule or set of rules, enforceable by the courts, regulating the government of a state, the relationship between the organs of government and the subjects of the state, and the relationship or conduct of subjects towards each other; the body of rules and principles governing the affairs of a community and enforced by a political authority, a legal system; the condition of social order and justice created by adherence to such a system." (Mifflin, 2009)

- b Nile valley citizens
 - c local-regional authority/central government
 - d additionally, the monastic community of Mount Sinai is considered as the fourth social component
- 38 Natural reserve:³⁴ St. Catherine Natural Protectorate houses the vicinity of the High Mountains of Sinai Peninsula (i.e. boundaries identification in 1996 CE; initial operation phase in 1996-2001 CE)
- 39 Ownership of land:³⁵ in 2007 CE, the Egyptian government declaration of 99 years Usufruct Right 'Leasehold' in Sinai Peninsula (i.e. a highly tension issue of geopolitical context regarding Sinai Peninsula and all the neighboring Arab lands to the newly born State of Israel in 1948 CE). This issue of interest considers the ownership of land by the Gebaliya and Awlad S'aed tribes in the High Mountains of Sinai Peninsula. Recently, Decree-law No. 14 of 2012 on the Integrated Development in Sinai Peninsula and Minister of Defense Decree No. 203 of 2012 on Ban ownership or the right of utilization, lease or make any type of behavior in the land and real estate in strategic areas of military importance and also prohibits land of Sinai Peninsula to non-Egyptians are under discussion (check Ch. 6)
- 40 Urban plan:³⁶ a sustainable urban plan for the town of Katharina was issued in 1998 CE
- 41 Distribution of subsidized goods: this issue of interest falls under the consumption of subsidies.³⁷ Until 2010+ CE, the distribution of subsidized goods system is still in action, being operated by the Egyptian government via a local outlet in the town of Katharina, serving both local Bedouin Community and Nile Valley citizens (i.e. all the residents of the rural-urban areas in the vicinity of the town of Katharina) (Tab.1)

³⁴ "A natural protectorate is defined as any area of land, or coastal or inland water characterized by flora, fauna, and natural features having cultural, scientific, touristic or esthetic value." (Prime Ministerial Decree, 1983)

³⁵ "Legal right to the possession of land." (Mifflin, 2009)

³⁶ "Integrates land use planning and transportation planning to improve the built, economic and social environments of communities." (Grogan, 2000)

³⁷ "Monetary assistance granted by a government to a person or group in support of an enterprise regarded as being in the public interest." (OECD, 2002)

- 42 Agriculture:³⁸ mountainous agriculture of orchards and plots does not fall under the issue of interest number 42, as the reclamation and rehabilitation activities fall under this issue, including
 - a plant nurseries managed by Bedouins
 - b acacia rehabilitation programmes
 - c cultivation of woody species using waste water (SEAM, 2003-2004)
- 43 Water: issue number 43 deals with the shortage in freshwater supply. In 2006-2010 CE, St. Catherine Waterline was established by South Sinai Regional Development Program 'SSRDP' (i.e. 4,000m³/day for the town of Katharina and W. Feiran; check timeline issue of interest number 3 'Groundwater recharge rate')
- 44 Electricity: constant limited daily supply to all rural-urban areas around the vicinity of the town of Katharina, produced by El Raha Plain power plant (i.e. 4 generators; capacity: 1.3 megawatts; consumption: 0.7 megawatts; unidentified number of small private generators in remote Bedouin villages-settlements)
- 45 Waste: the town of Katharina waste management plan deals with
 - a sewage (i.e. decentralized rural-urban sewage systems)
 - b solid waste (i.e. 12-14tons of solid waste/day/residents-commercial in 2009 CE) (SEAM, 2003-2004)
- 46 Clinic: upon the establishment of St. Catherine Natural Protectorate in 1996 CE (i.e. introduction of primary health service within the protectorate in 1998 CE)
 - c cooperation protocol between Health Services Directorate 'HSD' of South Sinai 'Ministry of Health' and St. Catherine Protectorate Management Unit 'PAMU', as the HSD supplies issued government medicines at an official government rate to the PAMU which assists in the health and medical campaigns
 - d health education service (i.e. Community Health Worker 'CHW': training of 9 Bedouin women in 2003 CE)

³⁸ "The science, art, and business of cultivating soil, producing crops, and raising livestock; farming" (Mifflin, 2009)

- e child growth monitoring for children under 5 years old was initiated in 2001 CE (i.e. medical and nutritional interventions of 448 children in 32 settlements within and outside the official boundaries of St. Catherine Natural Protectorate) (PAMU, 2003)
- 47 Hospital:³⁹ there is a public hospital in the town of Katharina (i.e. unidentified published medical capacity in 2010 CE; last detailed-published update in 1981 CE: 11 beds/1 hospital 'health unit'; 2 physicians/surgeons and 1 dentist) (Dames & Moore, 1979-1985)
- 48 South Sinai governor:⁴⁰ South Sinai governor is the head of the regional governing authority (i.e. South Sinai Governorate; 10 governors since 1980s CE). The governor acts as a regional national-domestic development mediator among different stakeholders' groups. (i.e. High Mountains of Sinai Peninsula 'criteria': (iv))
- 49 Military service:⁴¹ since 1980s CE (i.e. after Camp David between the Arab Republic of Egypt and State of Israel), all Sinai Peninsula Bedouins are subjected to the military service, including the Bedouin inhabitants of the High Mountains of Sinai Peninsula

3.5.8 Geopolitical

The study of the relationship among politics and geography, demography, and economics, especially with respect to the foreign policy of a nation (Mifflin, 2009).

I.e. High Mountains of Sinai Peninsula criteria: (iv).

- 50 Western influence: i.e. High Mountains of Sinai Peninsula 'criteria': (iv); check timeline issues of interest set 'theme': (vi). Western

³⁹ "As a matter of policy, no consultations are to be conducted at the PAMU office clinic except when an emergency arises; patients should be directed to the hospital for treatment....If the situation arises in which a case needs to be referred because surgical or specialist hospitalization is required, this will be done according to the procedures set out in the reference edition of this plan." (PAMU, 2003)

⁴⁰ "An official appointed to govern a territory." (Mifflin, 2009)

⁴¹ "A branch of the Armed Forces of a state in which persons are appointed, enlisted, or inducted for military service, and which operates and is administered within a military or executive department." (US Department of Defense, 2005)

funds potentially contribute in the natural-cultural resources conservation and socioeconomic development projects, being invested under specific policies which are oriented towards market economy and privatization policies

- 51 Peace treaty: Western funds reflect the potential Western state-based interest in the region 'Sinai Peninsula and the Middle East', being reflected in Camp David Peace Treaty between the Arab Republic of Egypt and the newly born State of Israel (i.e. the Middle East Economic Peace Concept; check timeline issue of interest number 28 'European Commission')

3.5.9 Management and monitoring 'capacity-building'

Often refers to assistance that is provided to entities, usually societies in developing countries, which have a need to develop a certain skill or competence, or for general upgrading of performance ability. Most capacity is built by societies themselves, sometimes in the public, sometimes in the non-governmental and sometimes in the private sector. Many international organizations, often of the UN-family, have provided capacity building as a part of their programmes of technical cooperation with their member countries. Bilaterally funded entities and private sector consulting firms or non-governmental organizations, called NGOs have also offered capacity building services. Sometimes NGOs in developing countries are themselves recipients of capacity building (Branes et al., 2003).

I.e. High Mountains of Sinai Peninsula 'criteria': (iv)

- 52 Education:⁴² all formal education activities and facilities fall under this issue of interest, being provided by the Egyptian Ministry of Education (i.e. preparatory and primary public schools in the rural-urban vicinity of the town of Katharina; last detailed-published update in 1981 CE: 12 rooms/3 schools, including 17 girls, 145 boys, 11 teachers and 6 other employees (Dames & Moore, 1979-1985); in 2009 CE, 951 students and 171 teachers per 19 schools exist within St. Catherine Natural Protectorate

⁴² "The largest sense is any act or experience that has a formative effect on the mind, character or physical ability of an individual. In its technical sense, education is the process by which society deliberately transmits its accumulated knowledge, skills and values from one generation to another." (Harper, 2010)

- 53 Scientific research:⁴³ considering the High Mountains of Sinai Peninsula, the main actors who are involved in scientific research are classified as follows
- a central government
 - b domestic-national/international universities, institutions and research centers
 - c domestic-national/international organizations
 - d domestic-national/international individual researchers
- 54 Training:⁴⁴ different training activities of interest for the local community are provided by various stakeholders in the High Mountains of Sinai Peninsula (i.e. High Mountains of Sinai Peninsula 'criteria': (iv)) (Tab. 15, 16 & 17)

3.5.10 Micro value

It is composed of two components:

- a immeasurable highly potential natural-cultural context
- b financially measurable goods-services (i.e. High Mountains of Sinai Peninsula 'criteria': (ii), (iii) & (iv))

⁴³ "The application of the scientific method, a harnessing of curiosity. The research provides scientific information and theories for the explanation of the nature and the properties of the world around us. It makes practical applications possible. Scientific research is funded by public authorities, by charitable organizations and by private groups, including many companies. Scientific research can be subdivided into different classifications according to their academic and application disciplines." (Trochim, 2008)

"Article titled: 'Ministers Council' demanding university(ies) fees to security authorities in their research with foreigners; (Letter no. 2-144 on 2 January, 2013)." (El Shrouk Newspaper, December 13, 2012).

⁴⁴ "The acquisition of knowledge, skills, and competencies as a result of the teaching of vocational or practical skills and knowledge that relate to specific useful competencies....In addition to the basic training required for a trade, occupation or profession, observers of the labor-market recognize today the need to continue training beyond initial qualifications: to maintain, upgrade and update skills throughout working life. People within many professions and occupations may refer to this sort of training as professional development." (Banzhaf, 1998)

- 55 Value of St. Catherine Natural Protectorate:⁴⁵ it is the intangible and tangible value of the natural-cultural resources of the High Mountains of Sinai Peninsula (i.e. generally but not strictly, it is an immeasurable highly potential value, as its state of conservation is an indicator-index for its preserved value). It is an extended value which falls under different perspectives (i.e. issues of interest)
- 56 Revenue:⁴⁶ the financial value of the heritage-based nano-economies in the High Mountains of Sinai Peninsula
- a eco-cultural tourism
 - b tourism services
 - c natural-cultural resources conservation job(s) and employment opportunities
 - d tourism accommodation facility(ies)
 - e tourism facilities
 - f museum
 - g medicinal plants
 - h handicrafts
 - i mountainous agriculture
 - j herding (i.e. value of the micro-economy; check Ch. 1)

The value of St. Catherine Natural Protectorate is currently being estimated according to the excursions sold by local tour operators (PAMU, 2003) (i.e. increasing number of sold excursions by local tour operators Vs maximum carrying capacity of the natural-cultural resources of St. Catherine Protectorate). It is necessary to highlight that the domestic-national funds represent a minor share in the total investment(s) and/or contribution(s), as the international funds represent a major significant share (i.e. natural-cultural conservation and socioeconomic development projects) (Tab. 7).

⁴⁵ "The desirability of a thing, often in respect of some property such as usefulness or exchangeability: worth, merit, or importance." (Mifflin, 2009)

⁴⁶ "The inflow of assets that results from sales of goods and services and earnings from dividends, interest, and rent. Revenue is often received in the form of cash but also may be in the form of receivables to be turned into cash at a later date." (Mifflin, 2009)

Table 7 Total investments in the High Mountains of Sinai Peninsula in 1980s-2010 CE

Organization/Project	Date	Investment
Sinai Development Authority	1980s-2002 CE	34,300,000 EP/ St. Catherine's council '3.5% of South Sinai investments'
Sinai Development Study 'USAID - Dames & Moore'	1979-1985 CE	3,421,000 US\$
St. Catherine Natural Protectorate 'European Commission'	1996-2001 CE	1,2000,000 €
Revenue	2000 CE	15,000,000 US\$
Medicinal Plants Project 'GEF - UNDP - GTZ/EU'	2002 CE	8,882,998 US\$
SEAM Program 'DFID'	2003-2004 CE	-----
South Sinai Regional Development Program 'SSRDP - European Commission'	2006-2010 CE	Unidentified amount of a total investment 64,000,000 €

3.6 Positioning timeline issues of interest, local nonprofit/for-profit stakeholders, economical transition phases, and indicators-indexes

Quality Function Deployment 'QFD' approach 'House of Quality' is

An approach that integrates the "voice of customer" into both product and service development (Stevenson, 2005).

Considering the High Mountains of Sinai Peninsula, the customer is the local community, as customer's requirements are the timeline issues of interest. Competitiveness evaluation is an essential section of the QFD approach; the timeline issues of interest were developed over a long time span, passing through consecutive economical transition phases under different administrations (Tab. 8).

Despite of the long time span, such a complex relation between different economical transition phases puts them in a competitive position (i.e. competitive position I), especially phase (c) on one hand, and phases (d), (e), (f) and currently (g) on the other hand; while the changing domestic-national socioeconomic policies under the same Egyptian administration since 1980s CE, it puts phases (d), (e), (f) and currently (g) in a competitive position (i.e. competitive position II; the economical transition phase (e) resulted an unclear position-impact status in the mountain range which was being translated into action via phase (f), before the current phase (g) takes place which increased the level of uncertainty). The term competitive position refers to the realization of the socio-ecological and socioeconomic deliverables (i.e. issues of interest) of each economical transition phase by the local community (Tab. 9, 10 & 11).

As a result of the existing competitive positions (I) and (II), the 56 timeline issues of interest are correlated with the 5 major phases (a), (b), (c), (d) and (f), in order to calculate a weight for each of the 10 customized sets of issues per each economical transition phase (i.e. equivalent to the UN themes), and to calculate an overall weight for each phase (i.e. correlation I). Actually, the main reasons behind using this correlation instead of using the UN sustainable development indicators in addressing the competitive position of each phase are the following:

- 1 unavailability of data per each economical transition phase
- 2 relative absence of reliable data

Accordingly, the timeline issues of interest act as natural-cultural resources conservation and socioeconomic development Route Cause Analysis 'RCA', addressing the conservation and socioeconomic issues via the study of human occupation development in the mountain range. In 2010 CE, post phase (f), it is crucial to address each of the 56 issues of interest to one another (i.e. intercorrelation between the 56 issues of interest: correlation II) in order to calculate the weight of importance-impact of each issue of interest (i.e. importance section in the QFD approach refers to the weight of customers' 'local community' requirements 'issues of interest').⁴⁷

⁴⁷ For higher accuracy, the weight of importance-impact is set as a proportional value which reflects the no. of issues of interest per each set.

Towards A Quantification Model

Table 8 A newly modified version of Quality Function Deployment 'QFD' approach, quantifying the relation(s) between timeline issues of interest, nonprofit/for-profit stakeholders, economical transition phases, and efficiency indicators-indexes in the High Mountains of Sinai Peninsula

Requirements		Importance (Scale of 4)	Nonprofit organizations - Projects													Competitive Evaluation								
			MT	CFSS	MPA	CESA	SCF	EECA	J NGO	GM NGO	FAN	SS	BCC	RPME	MPCP	A = 14th-Early 20th century CE B = 1914-1967 CE C = 1967-1983 CE D = 1983-Early 2000s CE X = 2010 CE								
Timeline Issues of Interest 'Local Community Needs' - Level of Interest																		(5 Highest)						
																		1	2	3	4	5		
Environmental - Natural Heritage	1	3	1	1	1	1	1	-	-	-	3	1	1	1	-	-	-	-	A BC D					
Migration	1	-	-	-	-	-	-	-	-	9	9	-	-	-	-	-	-	-	X					
Demographic	1	-	-	-	-	1	1	-	-	-	-	-	1	-	-	-	-	-	X					
Economy	2	3	1	3	-	1	1	-	-	3	9	3	3	3	-	A B	C	-	X					
Cultural Heritage	1	-	-	-	-	9	-	-	-	9	9	9	9	-	-	-	-	-	X					
Foreign funds	1	-	-	1	1	-	3	-	-	1	1	1	1	1	-	C	X	-	D					
Governance	2	1	1	3	1	1	3	-	-	1	3	3	1	3	A B	C	-	-	D X					
Geopolitical	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X					
Capacity-building	1	1	1	3	3	1	1	-	-	1	-	-	1	3	-	C	-	D	X					
Micro value	1	9	9	3	9	9	3	-	-	9	9	9	9	9	-	-	All	-	-					
Importance Weighting 'IW'		21	15	20	16	25	17	-	-	37	55	32	30	26										
Indicators-Indexes 'Governance- Foreign Organizations/Funds Needs' - Efficiency																		(5 Highest)						
																		1	2	3	4	5		
Integrity +	1	9	1	3	1	3	3	-	-	9	9	3	3	3	Inapplicable due to lack of historical data about Nonprofit Organizations - Projects									
Networking/ Clustering +	1	9	1	3	1	1	1	-	-	9	9	1	1	3										
Dependency -	1	9	9	1	1	9	1	-	-	9	9	1	1	1										
Transitions -	1	9	1	3	1	9	1	-	-	9	9	9	9	3										
Transparency +	1	9	3	3	3	9	3	-	-	9	3	1	9	3										
Accessibility +	1	9	9	3	9	9	9	-	-	9	9	9	9	3										
Consolidation -	1	9	3	1	1	9	1	-	-	9	9	1	1	1										
Beneficiary +	1	9	Declared Final Beneficiaries of Nonprofit Organizations - Projects																					
Empowerment +	1	9	3	3	3	1	1	-	-	9	3	1	1	3										
Polarization -	1	9	9	9	9	9	3	-	-	3	3	9	9	9										
Conservation +	1	3	9	9	9	9	9	-	-	9	3	3	9	9										
Cultural absorption +	1	9	9	9	3	9	3	-	-	9	9	1	9	9										
Accountability 'IW' +		102	57	47	41	77	35	-	-	93	75	39	61	47										
Target Values		Declared Capacity Profile of Nonprofit Organizations - Projects													<u>Relationships</u> Strong: • = 9 Medium: o = 3 Small: Δ = 1									
Technical Evaluation	5	Inapplicable due to lack of specific target values and historical data about Nonprofit Organizations - Projects																						
	4																							
	3																							
	2																							
	1																							

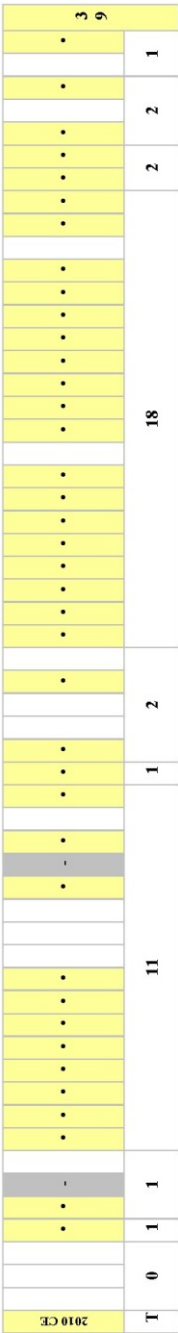


Table 10 SWOT Analysis for the economical transition phases

Economical Transition Phase	Strengths	Weaknesses	Opportunities	Threats
Mid 14 th century CE '14 th -Early 20 th century CE' Total Points: 11 Percentage: 19.64 %	<ul style="list-style-type: none">- Minimum impact on natural-cultural resources- Migration pattern relevant to carrying capacity of natural-cultural resources (housing/population)- Local community as a core stakeholder (i.e. limited conflict-competition)- Rise of traditional transportation as main economy- Tribal natural-	<ul style="list-style-type: none">- Marginal local community- Insufficient income-based/food from the traditional supportive economical activities 'critical role'- Local administration of 'Holy Monastery of St. Catherine'- Very small number of stakeholders (i.e. no economical and/or geopolitical interest 'investments')	<ul style="list-style-type: none">- Raw natural-cultural resources of relatively high potentials	<ul style="list-style-type: none">- Ownership of land (i.e. Ottoman-British empires conflict on Sinai Peninsula 'Egyptian land')- Western influence (i.e. British mandate)

Human Occupation Development

<p>cultural conservation policies</p> <ul style="list-style-type: none"> - Emergence of the first royal interest in the high mountains (i.e. Abbas Helmi Basha I) 	<ul style="list-style-type: none"> - Only, traditional regional market-trade 	
<ul style="list-style-type: none"> - Consumption rate below the carrying capacity of natural-cultural resources - Migration pattern relevant to carrying capacity of natural-cultural resources (i.e. housing/population) - Tribal natural-cultural conservation policies - Local community as a core stakeholder (i.e. limited conflict-competition) - Introduction of a distribution system for subsidized goods 	<ul style="list-style-type: none"> - Marginal local community - Decline of traditional transportation as main economy - Insufficient income-based/ food from the traditional supportive economical activities - Rise of illegal economy (i.e. smuggling) - Only, traditional regional market-trade for local products - Small number of local-regional 	<ul style="list-style-type: none"> - Ownership of land (i.e. Zionist-Israeli interest in establishing settlements on Arab lands) - Palestine War in 1948 CE - Suez Crisis in 1956 CE

Post World War I
'WWI'
1914-1918 CE
'1914-1967 CE'

Total Points: 12
Percentage: 21.42 %

Towards A Quantification Model

Post Six Days War 15th of June 1967 CE '1967-1983 CE' <i>Total Points: 19 Percentage: 33.92 %</i>	<ul style="list-style-type: none">- Introduction of eco-cultural tourism (i.e. modern market economy)- Introduction of new employment opportunities- Moderate number of stakeholders relative to natural-cultural resources- Geo-distributed final beneficiaries- Tribal-civil natural-	<ul style="list-style-type: none">- Relatively marginal local community<ul style="list-style-type: none">- Utilization of smuggling activities as a geopolitical tool- Only, traditional regional market-trade for local products- Military administration	<ul style="list-style-type: none">- Emergence of the town of Katharina (i.e. housing-population)- Introduction of development and local business opportunities	<ul style="list-style-type: none">- Desirability of young generations in traditional supportive economical activity Vs tourism-based economy- Increase of impact on cultural-natural resources<ul style="list-style-type: none">- The High Mountains of Sinai Peninsula as part of the occupied territories
		<ul style="list-style-type: none">employment opportunities<ul style="list-style-type: none">- Military administration- Small number of stakeholders (i.e. no investment)- Lack of social services and administrative facilities- Lack of capacity-building/training		

Human Occupation Development

<div>Post Camp David Peace Treaty between Egypt and Israel 1979 CE <i>'1983-Early 2000s CE'</i> Total Points: 39 Percentage: 69.64 %</div>	<p>cultural conservation policies</p> <ul style="list-style-type: none">- Emergence of NGOs- Introduction of social services and administrative facilities- Introduction of capacity-building/training- Scientific research			
	<ul style="list-style-type: none">- Introduction of the rising supportive-economical activity (i.e. medicinal plants and handicrafts)- Relative increase in employment opportunities (i.e. tourism-based revenues)- Increase of the international interest (i.e. investments-funds)	<ul style="list-style-type: none">- Relative lack of local community involvement- Mass tourism policy<ul style="list-style-type: none">- Decline of traditional supportive economical activities- Rise of illegal economy (i.e. smuggling)- Only, traditional regional market-trade for local products- Inefficient	<ul style="list-style-type: none">- Socioeconomic development and local business opportunities	<ul style="list-style-type: none">- Climate change 'Global Warming'- Loss of biodiversity- Increase of housing-population in the town of Katharina- Unrealistic national development plan (i.e. target-population Vs carrying capacity of natural-cultural resources and job market potentiality)- Ownership of land for

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<p>Post European Commission SSRDP 'South Sinai Regional Development Program' 2006-2010 CE '2010 CE'</p>	<ul style="list-style-type: none"> - Increase in the number of national infrastructure projects - Local-support NGO(s) - Declaration of St. Catherine Natural Protectorate - Introduction of agriculture - Provision of potential social services' and administrative facilities - Conduction of multipurpose international studies 	<p>privatization policies</p> <ul style="list-style-type: none"> - Partially out of action tribal-civil natural-cultural conservation policy - Threatened natural-cultural resources - Civil-military administration - Large number of stakeholders (i.e. conflict-competition) 	<p>investors (i.e. past-present geo-political conflicts in the Middle East)</p>
	<ul style="list-style-type: none"> - Mass tourism policy - Decline of traditional supportive economical activities - Rise of illegal economy 	<p>- Application of Decrease Theory simultaneously with the activation of natural-cultural conservation policies</p>	<ul style="list-style-type: none"> - Climate change 'Global Warming' - Loss of biodiversity - Increase of housing-population in the town of Katharina - Unrealistic national

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<p><u>Total Points: 39</u> <u>Percentage: 69.64 %</u></p>	<p>local community</p> <ul style="list-style-type: none">- Additional water resources (i.e. St. Catherine waterline)	<p>(i.e. smuggling)</p> <ul style="list-style-type: none">- Inefficient privatization policies- Partially out of action tribal-civil natural-cultural conservation policy- Threatened natural-cultural resources- Civil-military administration- Large number of stakeholders (i.e. conflict-competition)	<p>development plan (i.e. target-population Vs carrying capacity of natural-cultural resources and job market potentiality)</p> <ul style="list-style-type: none">- Ownership of land for investors (i.e. past-present geo-political conflicts in the Middle East)
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Table 11 Result of the correlation between timeline issues of interest and economical transition phases (High > 75%; 4% > Intermediate > 50%)

Economical Transition Phase	Timeline Issue 'Set'	Points per Set	Percentage per Set
Mid 14th century CE <i>'14th-Early 20th century CE'</i> <u>Total Points: 11</u> <u>Percentage: 19.64 %</u>	Environmental - Natural Heritage	3	100
	Migration	0	0
	Demographic	0	0
	Economy	5	31.25
	Cultural Heritage	0	0
	Foreign funds	0	0
	Governance	2	10
	Geopolitical	0	0
	Capacity-building	0	0
	Micro Value	1	50
Post World War I 'WWI' 1914-1918 CE <i>'1914-1967 CE'</i> <u>Total Points: 12</u> <u>Percentage: 21.42 %</u>	Environmental - Natural Heritage	3	100
	Migration	0	0
	Demographic	0	0
	Economy	6	37.5
	Cultural Heritage	0	0
	Foreign funds	0	0
	Governance	2	10
	Geopolitical	0	0
	Capacity-building	0	0
	Micro Value	1	50
Post Six Days War 5th of June 1967 CE <i>'1967-1983 CE'</i> <u>Total Points: 19</u> <u>Percentage: 33.92 %</u>	Environmental - Natural Heritage	3	100
	Migration	0	0
	Demographic	0	0
	Economy	7	43.75
	Cultural Heritage	0	0
	Foreign funds	1	20
	Governance	6	30
	Geopolitical	0	0
	Capacity-building	1	33.33
	Micro Value	1	50
Post Camp David Peace Treaty	Environmental - Natural Heritage	0	0

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between Egypt and Israel 1979 CE '1983-Early 2000s CE' <i>Total Points: 39</i> <i>Percentage: 69.64 %</i>	Migration	1	100
	Demographic	1	33.33
	Economy	10	62.5
	Cultural Heritage	0	0
	Foreign funds	5	100
	Governance	17	85
	Geopolitical	2	100
	Capacity-building	2	66.66
	Micro Value	1	50
Post European Commission SSRDP 'South Sinai Regional Development Program - SSRDP' 2006-2010 CE '2010 CE' <i>Total Points: 39</i> <i>Percentage: 69.64 %</i>	Environmental - Natural Heritage	0	0
	Migration	1	100
	Demographic	1	33.33
	Economy	11	68.75
	Cultural Heritage	1	100
	Foreign funds	2	40
	Governance	18	90
	Geopolitical	2	100
	Capacity-building	2	66.66
	Micro Value	1	50

In addition to the domestic-national funds for natural-cultural resources conservation and socioeconomic sustainable development, the international investments and contributions play a key role in the environment and development sectors, as the funds are supplied and directed to the local community via the following domestic-national channels:

- 1 public sector (i.e. local-regional authority/central government; generally but not strictly, infrastructure projects)
- 2 private sector (i.e. for-profit organizations; recent channel due to privatization policies; generally but not strictly, for-profit organizations which involve the largest number of final beneficiaries)
- 3 NGOs (i.e. nonprofit organizations; traditional channel, generally but not strictly, capacity-building activities and other social services) (Tab. 12)

The efficiency of the public sector channel is conducted by correlation (I), as phase (f) represents the current status of the Egyptian civil administration (i.e. it is too early to evaluate phase (g)).

Accordingly, the local nonprofit/for-profit stakeholders are correlated with the issues of interest (i.e. *correlation III*) in order to calculate a weight for each of the 10 customized sets of issues per each local nonprofit/for-profit stakeholder (i.e. *importance weighting 'IW' I* 'weight-relevance of stakeholders to issues of interest') (Tab. 13 & 14). Correlation (III) indicates the field of action of each local nonprofit/for-profit stakeholder, based on their Declared Capacity Profile 'DCF' (Tab. 15, 16 & 17). Due to the different capacities of local nonprofit/for-profit stakeholders, each of the stakeholders falls under different technical requirements, being set by the international granting organization(s) in order to deliver the services and activities of interest to the local community. Therefore, the local nonprofit/for-profit stakeholders occupy the technical requirements section of the QFD approach.

Table 12 The declared final beneficiaries of nonprofit/for-profit organizations

Abbreviation	Nonprofit Organizations – Projects	Declared Final Beneficiaries
Nonprofit Organizations		
MT	Makhad Trust	- Gebaliya Bedouins - St. Catherine Monastery - Tourists
CFSS	Community Foundation for South Sinai	- Gebaliya Bedouins
MPA	The Medicinal Plants Association (MPA)	- Gebaliya Bedouins? - 294 members (i.e. 88-112 women)
CESA	Community and Environmental Services Association (CESA)	- Gebaliya Bedouins
SCF	Saint Catherine Foundation	- St. Catherine Monastery
EECA	Egyptian Earth	- Gebaliya Bedouins

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	Construction Association (EECA)	
J NGO	Jebeliya NGO	-----
GM NGO	Gabal Mousa NGO	-----
Projects		
FAN	FANSINA Ltd.	- 460 Bedouin women/4 tribes 'website' - 300+ = 350 'Facebook'
SS	Sheikh Sina	- South Sinai Bedouins: Guides-cameleers/8 tribes
BCC	Bedouin Cultural Center	- 1,000 members/stakeholders - 6,000 Gebaliya Bedouin - 400,000 tourists/year
RPME	Restoration and Protection of monuments and Environment of St. Catherine's Monastery and the Summit of Gebel Musa	- Monastic community - 4,000 Gebaliya Bedouin - 450,000 tourists/year
MPCP	Medicinal Plants Project (MPCP)	- Bedouin Communities who live in St. Catherine Protectorate and derive their income mainly from wage labor - Small numbers of Bedouin who continue to largely depend on rangeland resources for their livelihoods - Hakim who derive their livelihoods directly from prescribing medicinal plants, and have both a strong conservation incentive, as well as a strong notion of intellectual property rights - The local businessmen who

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		<p>depend on the tourist trade (i.e. 300,000+ visitors/year), including Hoteliers and shop keepers, many of whom have migrated to the area</p> <ul style="list-style-type: none"> - Medicinal plant retailers and wholesalers who get their medicinal plant raw materials from St. Catherine - EEAA who is responsible for the management of the Protectorate - The South Sinai Governorate - Academic institutions conducting research in Medicinal Plants in Egypt - Details: farmers, collectors (i.e. 42-63, including 40-48 women), retailers, traditional healers, wholesalers, and processors [direct beneficiaries: 1,150-1,200+; indirect beneficiaries: 2,500; other: 5,000 Bedouins]
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But a question still stands; how to measure the actual efficiency of the local nonprofit/for-profit stakeholders under the absence of concrete measurable deliverables, in addition to the nature of the offered socio-ecological and socioeconomic services which are only measured and identified by the number of final beneficiaries? In other words, up to date, the evaluation of the socio-ecological and socioeconomic deliverables of the all domestic-national and international development funds is mainly based on two levels:

- 1 indirect long-term benefit (i.e. identified by a rough number of final beneficiaries)
- 2 relatively direct short-term benefit (i.e. identified by extensive lists of instant low impact unsustainable deliverables)

Very few exceptions maintain lists of sustainable potential deliverable(s) per individual(s) and/or household.

Actually, the QFD approach is designed to deal with industrial systems, where the requirements are precisely identified in terms of target values which are measurable via several engineering methods, techniques and tools. Under the absence of measurable target values, a

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Table 13 Argumentative Correlation between Timeline Issues of Interest and Nonprofit Organizations - Projects (Strong Positive: ●; Critical > 75%; ■74% > Important > 50%)

[illegible]

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[illegible]

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Table 14 Result of the correlation between timeline issues of interest and nonprofit organizations - projects (■ High > 75%; ■ 74% > Intermediate > 50%)

Economical Transition Phase	Timeline Issue 'Set'	Points per Set	Percentage per Set
Makhad Trust <i>Total Points: 18</i> <i>Percentage: 32.14 %</i>	Environmental - Natural Heritage	2	66.66
	Migration	0	-
	Demographic	0	-
	Economy	9	64.28
	Cultural Heritage	0	-
	Foreign funds	0	-
	Governance	4	20
	Geopolitical	0	-
	Capacity-building	1	33.33
	Micro Value	2	100
Community Foundation for South Sinai <i>Total Points: 7</i> <i>Percentage: 12.5 %</i>	Environmental - Natural Heritage	1	33.33
	Migration	0	-
	Demographic	0	-
	Economy	1	7.14
	Cultural Heritage	0	-
	Foreign funds	0	-
	Governance	2	10
	Geopolitical	0	-
	Capacity-building	1	33.33
The Medicinal Plants Association (MPA) <i>Total Points: 19</i> <i>Percentage: 33.92 %</i>	Environmental - Natural Heritage	1	33.33
	Migration	0	-
	Demographic	0	-
	Economy	7	50
	Cultural Heritage	0	-
	Foreign funds	1	20
	Governance	7	35
	Geopolitical	0	-
	Capacity-building	2	66.66
	Micro Value	1	50
Community and Environmental	Environmental - Natural Heritage	1	33.33

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Services Association (CESA)

Total Points: 10
Percentage: 17.85 %

Migration	0	-
Demographic	0	-
Economy	0	-
Cultural Heritage	0	-
Foreign funds	1	20
Governance	4	20
Geopolitical	0	-
Capacity-building	2	66.66
Micro Value	2	100

Saint Catherine Foundation

Total Points: 13
Percentage: 23.21 %

Environmental - Natural Heritage	1	33.33
Migration	0	-
Demographic	1	33.33
Economy	3	21.42
Cultural Heritage	1	100
Foreign funds	0	-
Governance	4	20
Geopolitical	0	-
Capacity-building	1	33.33
Micro Value	2	100

Egyptian Earth Construction Association (EECA)

Total Points: 15
Percentage: 26.78 %

Environmental - Natural Heritage	1	33.33
Migration	0	-
Demographic	1	33.33
Economy	2	14.28
Cultural Heritage	0	-
Foreign funds	2	40
Governance	7	35
Geopolitical	0	-
Capacity-building	1	33.33
Micro Value	1	50

Jebeliya NGO

Total Points: -
Percentage: -

Environmental - Natural Heritage	-	-
Migration	-	-
Demographic	-	-
Economy	-	-
Cultural Heritage	-	-
Foreign funds	-	-
Governance	-	-
Geopolitical	-	-
Capacity-building	-	-

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Gabal Mousa NGO

Total Points: -

Percentage: -

Micro Value	-	-
Environmental - Natural Heritage	-	-
Migration	-	-
Demographic	-	-
Economy	-	-
Cultural Heritage	-	-
Foreign funds	-	-
Governance	-	-
Geopolitical	-	-
Capacity-building	-	-
Micro Value	-	-

FANSINA Ltd.

Total Points: 16

Percentage: 28.57 %

Environmental - Natural Heritage	0	-
Migration	1	100
Demographic	0	-
Economy	6	42.85
Cultural Heritage	1	100
Foreign funds	1	20
Governance	4	20
Geopolitical	0	-
Capacity-building	1	33.33
Micro Value	2	100

Sheikh Sina

Total Points: 26

Percentage: 46.42 %

Environmental - Natural Heritage	2	66.66
Migration	1	100
Demographic	0	-
Economy	11	78.57
Cultural Heritage	1	100
Foreign funds	1	20
Governance	8	40
Geopolitical	0	-
Capacity-building	0	-
Micro Value	2	100

Bedouin Cultural Center

Total Points: 22

Percentage: 39.28 %

Environmental - Natural Heritage	1	33.33
Migration	0	-
Demographic	0	-
Economy	9	64.28
Cultural Heritage	1	100
Foreign funds	1	20

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	Governance	8	40
	Geopolitical	0	-
	Capacity-building	0	-
	Micro Value	2	100
Restoration and Protection of monuments and Environment of St. Catherine's Monastery and the Summit of Gebel Musa	Environmental - Natural Heritage	1	33.33
	Migration	0	-
	Demographic	1	33.33
	Economy	5	35.71
	Cultural Heritage	1	100
	Foreign funds	1	20
	Governance	4	20
	Geopolitical	0	-
	Capacity-building	1	33.33
	Micro Value	2	100
<i>Total Points: 16</i>			
<i>Percentage: 28.57 %</i>			
Medicinal Plants Project (MPCP)	Environmental - Natural Heritage	1	33.33
	Migration	0	-
	Demographic	0	-
	Economy	7	50
	Cultural Heritage	0	-
	Foreign funds	1	20
	Governance	7	35
	Geopolitical	0	-
	Capacity-building	2	66.66
	Micro Value	2	100
<i>Total Points: 20</i>			
<i>Percentage: 35.71 %</i>			

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Table 15 Nonprofit organizations 'declared capacity profile pre the Egyptian National Reforms Revolution of January 25, 2011 CE - status 2010-2013 CE'

Nonprofit Organizations	Mission	Vision	Activities/Beneficiaries	Projects + Funding Source(s)
Makhad Trust (1993 CE - UK, 2005 CE - Egypt) <i>'Board of trustees'</i> <i>'Independent website'</i> <i>'Facebook'</i> <u>Executive</u> Danny Shmulevitch <u>Activity</u> <u>geo-distribution:</u> Northern half <u>Note:</u> Possibility of	Sustain the environment and the natural heritage of people	People: Sustainable living and traditional culture protection projects (i.e. local entrepreneurs with leadership quality; Mahmoud/Ahmed Mansur, Selema and Farag Fox) <u>Spirit:</u> Guest and host cultural exchange <u>Environment:</u> Promotion of sustainable economy while protecting the environment (i.e. water preservation and land use)	Sole, partnership and sponsorship projects <u>Master-target:</u> - Sustainable economic development (i.e. garden restoration: water wells, water tanks, conduits, irrigation system, dams, paths, renovate multipurpose buildings and develop clean energy pumps) - Supporting the traditional culture - Development of the educational-training resources <u>Product/output:</u> - Produce, dry, pack and sell herbs-fruits - Development of the	<u>Completed projects:</u> 1. Anran gardens (Gebaliya Bedouin, tourists and St. Catherine Monastery) 2. Abu Sila herb and fruit drying centre (30 Gebaliya families and garden owners) 3. Dr Ahmed's Herbal School (Gebaliya students + local producers) 4. Fansina Bedouin Women's Craft Centre (300 families) 5. Water Preservation in the Mountain Gardens (March 2013: 10-12

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future geopolitical complication which would cause local resistance to change (i.e. suspension of activities without the provision of an alternative actor)

hospitality traditions
- Garden compost toilets
- Women's crafts centre
- Bedouin museum
- Provision of computers and computer training courses
- Provision of employment 'entry level' beneficiaries:
- Gebaliya Bedouins
- St. Catherine Monastery
- Tourists

dams/public-private benefit)
Current projects:
1. Gardens Restoration - 2011 scheme (30 gardens + 6 clean energy pumps)
2. Fox Camp Bedouin Museum
3. Community Drinking Water Wells
(3 water wells; Abu Gifa 40, Zaituna 65-70 and Seba'aiya 15+20 families)
Funding source(s) + volunteering:

1. Working journeys (Nomadic Journeys Ltd.
8-12 individuals)
2. Charitable donations
3. Membership
4. Partnership
5. Sponsorship
6. Other fund raising

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Partnership: the Eden Project, Jebeliya NGO (Egypt), the Centre for Himalaya Studies, the Waldorf Project, Ruskin Mill Educational Trust, Isbourne Holistic Education Centre, and Global Environment Facility ‘GEF’/Medicinal Plants Conservation Project ‘MPCP’ + St. Catherine Monastery, Ahmed/Mahmoud Mansur, Farag Fox, Selema, garden owners, other Gebaliya individuals of interest and SheikhSina Bedouin Co.

Sponsorship: Eden Project, Ruskin Mill College, UK citizens, EU citizens and undeclared sponsors

Fund raising: craft fairs, speaking engagements, coffee mornings, Sinai product sale, auctions and evening functions

Notes:
‘Transparency’

Community Foundation for South Sinai (2006 CE - Egypt/UK) <i>‘Board’</i> <i>‘Independent website’</i> <u>Activity</u> <u>geo-distribution:</u> Northern half	<div>(?) Commitment to sustainable culturally appropriate and environmentally friendly development</div> <div>(?) - Research-based sustainable development - Mobilization of the resources towards sustainable development</div>	<div>Sole and partnership projects</div> <div><u>Master-target:</u> - Sustainable development and job creation - Education - Health - Conservation of environment and heritage - Community capacity-building and social welfare <u>Beneficiaries:</u> - Gebaliya Bedouins</div>	<u>Completed projects:</u> <div>1. Mount Sinai Bedouin Wool Project 2. (20 Bedouins) Crop Diversification (honey-olives) 3. Olive oil Press 4. Portable Drill and Generator 5. Environmental Education for Bedouin Children 6. School Equipment and Exam Fees (25 children) 7. Community Drinking Water (W. Sa'ab - 300</div>

-
8. families)
Suppressing
Mosquitoes
(60 remote
families/6 months;
30 L.E./month/250
liters)
 9. Support for Bedouin
Musicians
(two musicians)
 10. The Jebeliya Camel
Race and other
tribes.
 11. Land Day (solid
waste management)
 12. Community
Capacity-building
and Social Welfare
 13. A Fine New Camel
(1 Bedouin)
 14. Food Distributing
for Ramadan
(400 families)/Gabal
Mousa NGO?
 15. Helping Children
have Fun
- Current projects:
1. Palm Baskets in W.
-

<p>Notes: <i>'Transparency'</i></p> <p>The Medicinal Plants Association (MPA) (2004 CE - Egypt) <i>'Dependent website'</i></p> <p><u>Activity</u> <u>geo-distribution:</u></p>	<p>(?) Support the conservation and sustainable use of medicinal plants</p> <p>(?) Creation of a better future for the subsequent generations through community development</p> <p>Master-target: - Technical-financial support for Bedouins in collecting/ cultivating, propagating, processing, 'drying, storing, selection, packing' and marketing of medicinal plants, in addition to the provision of seedlings <u>Product/output:</u> - Wild and organic</p>	<p>Feiran</p> <p>2. Fairly-traded Product Development 3. Promoting Girls' Literacy <u>Funding source(s) + volunteering:</u> 1. Charitable donations 2. Partnership (≈) 3. Sponsorship (≈)</p>
<p><u>Partnership:</u> + University of Manchester, BioMAP (Egypt) and St. Catherine Natural Protectorate <u>Sponsorship:</u> Nottingham university</p>		<p>Project: 1. Medicinal Plants Conservation Project 'MPCP' <u>Fund source(s) + volunteering:</u> 1. United Nations Development Programme 'UNDP' 2. Partnership</p>

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Northern half (check MPCP: Table 5)			medicinal plants - Wild honey Beneficiaries: - Gebaliya Bedouins? - 294 members (i.e. 88-112 women)	
Notes: <i>'Transparency'</i>	<u>Partnership:</u> Medicinal Plants Conservation Project 'MPCP' + St. Catherine Natural Protectorate			
Community and Environmental Services Association (CESA) (2007 CE - Egypt) 'Board' 'Independent website' Activity <u>geo-distribution:</u> Northern half + Low-elevated	Scientific and practical techniques for environmental, social and health services	(?) - Health care for the family - Social welfare - Development of family economy - Social assistance - Cultural and scientific services - Environmental services - Conservation of culture and heritage	<u>Master-target:</u> - Provision of services: health, veterinary, social, culture & heritage and training courses for local Bedouins <u>Product/output:</u> <i>Awareness campaigns</i> - Harmful effects of smoking - Environmental camp on sustainability and bio-diversity and natural balance - Birds flu - Environmental day - Carbon reduction - Food contamination	<u>Projects:</u> 1. Cultural Heritage Unit (30 local instructors + 50 Children) 2. Water Quality Unit (Zeituna water well) 3. Clinical Examination Unit (307 patients were examined/42 months) 4. Mobile Veterinary Unit (4,570 animal-heads: 356 camels, 1,348 sheep and 2,866 goats) 5. Mushroom

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valleys		<div>- Water pollution</div> <div>- Environmental rights <i>Booklets</i></div> <div>- Women rights in Sinai</div> <div>- Food contamination by mycotoxins and their effects on human health</div> <div>- Practical course keys to the genera treated</div> <div>- Taxonomic criteria of Ascomycetes</div> <div>- Simplified and useful in the healthy regulated food</div> <div>- Mushroom fundamentals</div> <div><i>Zeituna water desalination plant</i></div> <div><u>Beneficiaries:</u></div> <div>- Gebaliya Bedouins</div>	<div>Production Unit (training: 106 local Bedouin women + 97/13 under do cultivation)</div> <div><u>Fund source(s) + volunteering:</u></div> <div>1. EU Commission (Phase I) - South Sinai Regional Development Program (SSRDP)</div>
		<div>Husbandry: town of St. Catherine and surrounding 29 settlements: 356 camels (i.e. 386 tourism camels?); 1,348 sheep and 2,866 goats</div> <div><u>Governmental sheikh:</u> Mohamed Auda</div> <div><u>Tarfat El Qidarein sheikh:</u> Hassan Abu Matr</div> <div><u>Cameleers sheikh:</u> Taha Khder</div>	

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Saint Catherine Foundation (1996 CE - UK) <i>'Board of trustees'</i> <i>'Independent website'</i> <u>Activity</u> <u>geo-distribution:</u> Northern half	(?) Support conservation work at St. Catherine's Monastery	<p>Sole and partnership projects</p> <p><u>Master-target:</u> Conservation-preservation works</p> <p><u>Product/output:</u> <u>Restoration-renovation works</u> <u>Books</u></p> <p>- The Monastery of St. Catherine</p> <p>- Sinai, Byzantium, Russia: Orthodox Art from the Sixth to the Twentieth Century</p> <p>- St. Catherine's Portfolio</p> <p>- Christmas cards</p> <p><u>Beneficiaries:</u></p> <p>- St. Catherine Monastery</p>	<p><u>Completed projects:</u></p> <ol style="list-style-type: none">1. Water Pumping Station (1998 CE)2. Kitchen Transfer (2002 CE)3. Manuscript of Cell 31a (2002 CE)4. The East Wing Cells (2004-2008 CE) <p><u>Current projects:</u></p> <ol style="list-style-type: none">1. Life and Fire Safety Project2. Manuscript Boxing Programme (start: 1999 CE)3. Library Conservation Project (start: 2001 CE)4. South Wing Project: Library Expansion and Reconfiguration (start: 2007 CE) <p><u>Fund source(s) + volunteering:</u></p> <ol style="list-style-type: none">1. Charitable donations2. Membership
Notes:	<u>Partnership:</u> Ministry of Antiquities, Ex-SCA: Supreme Council of Antiquities (≈)		

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<i>‘Transparency’</i>	<u>Collaboration:</u> Ligatus Research Unit and University of Arts London ‘Camberwell College of Arts’	
<p>Egyptian Earth Construction Association (EECA)</p> <p>(2007 CE - Egypt)</p> <p>Sinai executive ‘interactive role’: Nashwa Ibrahim</p> <p><u>Activity</u> Northern half</p>	<p>Appropriate Building Technology ‘ABT’ as a tool for sustainable development and community building:</p> <ul style="list-style-type: none"> - Use local building materials - Utilize renewable sources of energy and implement energy saving techniques - Harmonize with the environment and play a part in the development of local communities 	<p>(?)</p> <ul style="list-style-type: none"> - Disseminate appropriate technologies and promote their role in preserving the environment and responding to cultural traditions and socio-economic needs - Conduct, document, and encourage research activities to develop innovative building techniques with local materials with respect to energy efficiency and economic self-sufficiency - Provide technical assistance and consultancy services on ABT for organizations, communities and
	<p><u>Master-target:</u></p> <ul style="list-style-type: none"> - Participatory design and construction of housing models for youth using alternative building techniques and materials <p><u>Product/output:</u> <u>Construction</u></p> <ul style="list-style-type: none"> - Sheikh Sina Ecolodge - Sheikh Sina Training Centre - Project’s office at Abu Zeituna - Additional output(s)? <u>Book</u> <p><u>Beneficiaries:</u></p> <ul style="list-style-type: none"> - Gebaliya Bedouins 	<p><u>Completed projects:</u></p> <ol style="list-style-type: none"> Housing Models in Small-Scale Settlements for Youth <u>Fund source(s) + volunteering:</u> EU Commission (Phase I) - South Sinai Regional Development Program (SSRDP) Membership

Gabal Mousa
NGO

Notes:
'Transparency'

Table 16 European Commission projects 'declared capacity profile pre the Egyptian National Reforms Revolution of January 25, 2011 CE - status 2010-2013 CE'

Organizations	Mission	Vision	Activities/Beneficiaries	Funding Source(s)
FANSINA Ltd. (2002 CE - Egypt) <i>'15 Bedouin partners, including 4 managing partners'</i> Former: <i>'Craft and Income Generation Project of the Bedouin Support Program'</i> (1997 CE - Egypt) <i>'Independent website'</i>	(?) Production of traditional Bedouin embroidery and handmade designs - customized modern practical products <u>Former:</u> <i>'Preservation of the local Bedouin handicrafts (display not sell)'</i>	(?) <u>Social aspect:</u> Targeting women with no alternative sources of income <u>Cultural aspect:</u> Preservation of tradition and local handicrafts, teaching the younger generation the trade <u>Economic aspect:</u> Maintenance of fair trade principles while encouraging Bedouin females to create marketable products	<u>Master-target:</u> - Provision of income/ Bedouin woman via Handicrafts production <u>Product/output:</u> - Backpacks - Bead bags - Beadspreads - Bottle cocers - Bracelets - Cushions - Coasters - Computer cover - Curtains - Dindisha - Jewelry bag	<u>Funding source(s) + volunteering:</u> 1. Initial fund: EU Commission (Phase I) - South Sinai Regional Development Program (SSRDP) Reimbursed profits + transferable shares 2.

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<p><i>'Facebook'</i></p> <p><u>Executive</u> <u>'interactive role':</u> Selema Gabaly 'Since 2000 CE'</p> <p><u>Activity</u> <u>geo-distribution:</u> Northern half</p>		<p>- Key holders - Mobile cases</p> <p><u>Beneficiaries:</u> - Town of St. Catherine <u>Website:</u> 460 Bedouin women/ 4 tribes <u>Facebook:</u> 300+ '350' - Average income/Bedouin woman: 8.3-21 € - Max. income/Bedouin woman: 138 €</p>		<p><u>Funding source(s) + volunteering:</u> 1. Initial fund: EU Commission (Phase I) - South Sinai Regional Development Program (SSRDP) Sheik Musa's and Farag Fox families</p>
<p>Sheikh Sina (2007 CE - Egypt)</p> <p><i>'Independent website'</i> <i>'Facebook'</i></p> <p><u>Executive</u> <u>'interactive role':</u> Sheikh Musa</p>	<p>(?) Actively preserve South Sinai's unique cultural and natural heritage by promoting and operating locally- led responsible tourism</p>	<p>To set the St. Catherine Protectorate as one of the world' great mountain protectorates through the conservation and sustainable development of its natural and cultural resources and thereby ensure long-term local and national</p>	<p><u>Master-target:</u> <u>Ecotourism</u> - Eco-friendly tour operators 'Vs mass tourism - max. 15-20 individuals/group + max. tourists/trail' - Contributor in the conservation of the biodiversity - Employment of local people - Provision of a learning</p>	

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<u>Activity</u> Geo-distribution: Northern half + South Sinai	benefits for the people of Egypt (i.e. the exact vision of St. Catherine Natural Protectorate)	<div>experience</div> <div>- Limitation of resources consumption - Participation- involvement of local community</div> <div><u>Product/output:</u> - Desert-mountain tours - Building ecolodge(s) - Installation of compost toilets - Recycling grey water - Maintenance of water wells - Maintenance of dams - Waste management measures - Reinvestment in local community: education, healthcare, training local guides on first aid, group management and language (i.e. English, Hebrew and German)</div> <div><u>Beneficiaries:</u> - South Sinai Bedouins: Guides-cameleers /8 tribes</div>
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<p>Bedouin Cultural Center <i>'Sherka Ahia Toras el Badaui'</i> (2007 CE - Egypt)</p> <p><i>'Independent website'</i></p> <p><u>Executive 'interactive role':</u> Dr. Christos Lambridis LAMANS SA. <i>'Greek Co.'</i></p> <p><u>Activity</u> <u>Geo-distribution:</u> Northern half</p>	<p>(?) Linking and securing the past to the future as far as it concerns the local Gebaliya Bedouin tribe</p>	<p>(?) - Contribution to the study and preservation of the cultural heritage of the Gebaliya tribe - Contribution to the economic development of the Gebaliya tribe through creation of income generation and employment opportunities</p>	<p><u>Product/output:</u> <u>Reports 'studies'</u> - History and life cycle - Language and cultural activities - Handicrafts - Agriculture and animal husbandry - Knowledge on natural environment - Medicinal plants <u>Bedouin Village</u> - Ethnographic Museum <u>in addition to</u> - Enhancement of education and capacities of Bedouins - Increased public awareness on the Bedouin traditions</p> <p><u>Beneficiaries:</u> - 1,000 members/stakeholders - 6,000 Gebaliya Bedouin - 400,000 tourists/year</p>	<p><u>Funding source(s) + volunteering:</u> Initial fund: 1,200,000 € EU Commission (Phase I) - South Sinai Regional Development Program (SSRDP)</p> <p>1.</p>
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<p>Restoration and Protection of monuments and Environment of St. Catherine's Monastery and the Summit of Gebel Musa</p> <p>(2007 CE - Egypt)</p> <p><i>'Independent website'</i></p> <p><u>Executive 'interactive role':</u></p> <p>Dr. George Triantaphyllidis</p> <p>Activity</p> <p><u>geo-distribution:</u></p> <p>Northern half</p>	<p>(?)</p> <p>Set an archaeological zone, all the area to the east of the main road (i.e. the three mountains: G. Katharina, G. Musa and G. El Dier, including the valleys between them: W. Arba'iein and W. El Dier)</p>	<p>(?)</p> <p>Implementation of the guidelines set by the International Council of Monuments and Sites 'ICOMOS' and the nomination of the monastery to the United Nations Educational, Scientific and Cultural Organization 'UNESCO' World Heritage List</p>	<p><u>Product/output:</u></p> <ul style="list-style-type: none">- The protection of the architectural heritage that is endangered by natural causes (floods, earthquakes), uncontrolled development and tourist attack- Education of visitors through signage and an exhibition for a better interpretation of the history of the site- Improvement of visitor and automobile circulation- Encourage a longer stay, providing more points of interest within the archaeological park (i.e. settlements, quarries, hermitages, chapels, mosques, aqueducts, exhibition in the barracks...etc.)- Remove pressure from the monastery itself, by providing more places to	<p><u>Funding source(s) + volunteering:</u></p> <p><u>Initial fund:</u></p> <p>2,700,000 €</p> <p>EU Commission (Phase I) - South Sinai Regional Development Program (SSRDP) Details:</p> <p>St. Catherine Monastery: 1,500,000 €</p> <p>G. Musa: 1,200,000 €</p>
			<p>1.</p>	

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			<div>visit</div> <div>- Protect the environment from damage caused by development to the landscape and prevent groundwater contamination</div> <div>- Offer additional employment opportunities</div> <div><u>Beneficiaries:</u></div> <div>- Monastic community</div> <div>- 4,000 Gebaliya Bedouin</div> <div>- 450,000 tourists/year</div>
<div>Notes:</div> <div><i>'Transparency'</i></div> <div>Medicinal Plants (2007 CE - Egypt)</div> <div><u>Executive</u></div> <div><u>'interactive role':</u></div> <div>Ahmed Mansur</div> <div><u>Activity</u></div> <div>geo-distribution:</div> <div>Northern half</div> <div>Bedouin</div> <div>Mechanic at</div>	<div>Partnership: LAMANS Management Services SA, and Ministry of Antiquities 'Ex-SCA: Supreme Council of Antiquities' (\approx)</div>		
			<div><u>Beneficiaries:</u></div> <div>- 12 students: 6 boys and 6 girls '12-18 years old'</div>

Tarfat El Qidarein (2007 CE - Egypt) <u>Activity</u> <u>Geo-distribution:</u> Northern half + low valleys ⁴⁸			
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⁴⁸ European Commission previously-currently executed projects in the High Mountains of Sinai Peninsula (Phase I)
South Sinai Regional Development Program:

- FanSina (Selema Gabaly)
- Sheikh Sina (Sheik Musa's and Farag Fox families)
- Egyptian Earth Construction Association 'EECA'
- Community and Environmental Services Association (CESA)
- The Holy Monastery of St. Catherine
- Bedouin Cultural Center
- Medicinal Plants (Ahmed Mansur)?
- Bedouin Mechanic at Tarfat El Qidarein?
- Jebel Mousa Association?
- Jebeliya NGO?
- Solar Cells Distribution Project? 'South Sinai'
- Medical Convoy? 'South Sinai'
- St. Catherine Waterline (i.e. 4,000 Cubic Meters for the town of St. Catherine and W. Feiran)
 - + Other: St. Catherine Natural Protectorate
 - + Other: Medicinal Plants Conservation Project (MPCP) [non-EU/UNDP]
 - + Other: BioMAP Project [non-EU/UNDP + Italian Cooperation] 'Egypt'

Table 17 Other projects 'declared capacity profile pre the Egyptian National Reforms Revolution of January 25, 2011 CE - status 2010-2013 CE'

Organizations	Mission	Vision	Activities/Beneficiaries	Funding Source(s)
Medicinal Plants Project (MPCP) <i>'Egypt- Conservation and Sustainable Use of Medicinal Plants in Arid and Semi-Arid Ecosystems'</i> (2002 CE - Egypt) <i>'Independent website'</i> <u>Activity geo-distribution:</u> St. Catherine Natural Protectorate <u>Species statistics:</u> - Past: 529 - Present: 316-472	Conservation and sustainable use of globally significant medicinal plant biodiversity in St. Catherine Protectorate	Support good governance through establishment of Medicinal Plant Strategic Action Plan and legal framework on Intellectual Property Rights	<p><u>Master-target:</u></p> <ul style="list-style-type: none"> - On-site protection of globally significant biodiversity in the project site. Action will be taken to broaden these initiatives beyond the selected priority sites to others in the country - Improve knowledge of biodiversity, habitats and ecosystems, inter-linkages, distribution, threats and uses - Improve capacity, at the local and national levels, to address biodiversity issues in lateral and integrated planning levels - Establish a solid legal framework for the protected area - Develop a detailed assessment of threatened species and appropriate measures (Management Plan) for their conservation. - Increase public awareness with respect to the importance of natural 	<p><u>Funding source(s) + volunteering:</u></p> <p><u>Initial fund:</u></p> <p>1. US\$ 8,882,998</p> <p><u>Details:</u></p> <ul style="list-style-type: none"> - GEF: US\$ 4,117,000 - UNDP: US\$ 500,080 - GTZ/EU- (in kind): US\$ 618,900 - Government (in kind): US\$ 3,004,820 - Private (in kind): US\$ 226,3981 - Local/ others (in kind):

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<ul style="list-style-type: none">- Lost: 213- Endemic: 33/Sinai + 4/Egypt- Global <p>significance: 19</p> <ul style="list-style-type: none">- 47% have medicinal, aromatic, cosmetic or culinary uses <p><u>Production facilities:</u></p> <p>11 Bedouin orchards</p> <p>+</p> <p>6 propagation and cultivation greenhouses</p>	<ul style="list-style-type: none">- resources conservation.- Ensure grassroots (Stakeholders) involvement in biodiversity conservation- Setup a monitoring system for globally threatened medicinal plant biodiversity- Implement a series of training for biodiversity experts and other relevant participatory bodies- Establish local level management structures to ensure sustainable use of medicinal plants- Indirect goals include: human health improvement, employment creation, increased sustainable Tourism....etc. <p>Product/output:</p> <ul style="list-style-type: none">- Critically endangered medicinal plant species protected- Over-used and vulnerable medicinal plants cultivated- Best practices for medicinal plant collection introduced and collection levels regulated- Alternative energy sources promoted- Grazing management plans	US\$415,800
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Note:

- 80% of the world's population depends on

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medicinal plants for health-care	designed and implemented
- 55 handicrafts received training on packing	- Community medicinal plants related Intellectual property rights protected
- 54 microloans for Bedouin women	- Best practices to protect medicinal plants promoted to other sites <u>Beneficiaries:</u>
- National trade: 5-40 tons of unprocessed material	- Bedouin Communities who live in St. Catherine Protectorate and derive their income mainly from wage labor
- St. Catherine’s market: 10 tons of processed material	- Small numbers of Bedouin who continue to largely depend on rangeland resources for their livelihoods
- 350 direct/indirect jobs	- Hakim who derive their livelihoods directly from prescribing medicinal plants, and have both a strong conservation incentive, as well as a strong notion of intellectual property rights
- Provision of 125 natural gas ovens and 275 natural gas bulbs for 500 households	- The local businessmen who depend on the tourist trade (i.e. 300,000+ visitors/year), including Hoteliers and shop keepers, many of whom have migrated to the area
- 90% of an estimate of 200 feral donkeys– 75%–in 2006 CE	- Medicinal plant retailers and wholesalers who get their medicinal

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were captured to prevent grazing pressure, amounting to 4,886,438 EGP / 325,763 kg and 8,377 EGP / 837,675 liters of water ⁴⁹		plant raw materials from St. Catherine
		- EEAA who is responsible for the management of the Protectorate
		- The South Sinai Governorate
		- Academic institutions conducting research in Medicinal Plants in Egypt
		- Details: farmers (i.e. 102 / 17 Bedouin orchards and 200 beehives / 15 household '25% revenues to MPA'), collectors (i.e. 63, including 48 women), retailers, traditional healers, wholesalers, and processors to produce 150 products (i.e. packing 'handicrafts' is provided by 55 women); all provide 108 permanent employment opportunities

⁴⁹ Note: European Commission - South Sinai Regional Development Program 'declared budget'

- Initial fund: 64,000,000 €
- Total 'actual': 57,000,000 €

Details:

- Component I (i.e. 16 contracts): 34,500,000 €
- Component II (i.e. 55 contracts): 21,500,000 €
- Governmental Bedouin Sheikhs (i.e. 124 contracts): 1,000,000 €

*TRA threat reduction index = (56%): 90% feral donkeys; 80% destructive harvesting; 60% over harvesting; 40% tourists' intrusion; 40% scientific research; 20% overgrazing; 5% urbanization; 5% quarrying.

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[direct beneficiaries: 1,150-1,200+;
indirect beneficiaries: 2,500; other:
5,000 Bedouins]

‘modified QFD’ (Tab. 8) is introduced in order to bridge the gap (i.e. the underlined term ‘target value’ refers to two components as part of its nature:

- 1 the number of final beneficiaries ‘measurable’
- 2 quality/social-absorption/impact of the delivered socio-ecological and socioeconomic services ‘relatively immeasurable’). One of the main aims of the model is to develop a customized set of indicators-indexes to be able to identify and address the weight of the second component of the target value relative to each local nonprofit/for-profit stakeholder independently (i.e. importance weighting ‘IW’ II).

There is no doubt, the developed customized set of indicators-indexes identifies and addresses the overall accountability (i.e. master-indicator; importance weighting ‘IW’ II) of the local nonprofit/for-profit stakeholders in the mountain range, acting as a keystone in order to relatively measure the second component of the target value (i.e. quality/social-absorption/impact); it is a set of 12 indicators-indexes:

- 1 Integrity (+): integrity of a local nonprofit/for-profit stakeholder with other stakeholders on local-micro level
- 2 Networking/Clustering (+): interconnection and integrity of a local nonprofit/for-profit stakeholder with other stakeholders on regional-macro level (i.e. extended socio-ecological/socioeconomic services and activities)
- 3 Dependency (-): basically but not strictly, the financial dependency of a local nonprofit/for-profit stakeholder on domestic-national and international organization which grants instant-short and medium term funds (i.e. 1-5 years) for the delivery of socio-ecological/socioeconomic services and activities (i.e. with exception to restoration and infrastructure works)
- 4 Transitions (-): actual establishment and registration of a local nonprofit/for-profit stakeholder for a certain purpose without a concrete guarantee of continuity (e.g. acquirement of a grant by a domestic-national and international organization for a geopolitical reason)

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- 5 Transparency (+): basically but not strictly, the availability of detailed and published monthly, quarterly and annual reports, issued by a local nonprofit/for-profit stakeholder and/or a granting organization, including detailed information about the two components of the target value
- 6 Accessibility (+): ability of local community to access socio-ecological/socioeconomic services and activities, provided-delivered by a specific local nonprofit/for-profit stakeholder
- 7 Consolidation (-): the capacity-ability of a local nonprofit/for-profit stakeholder to provide relatively extended socio-ecological/socioeconomic services and activities on local-micro level (i.e. additional services-activities)
- 8 Beneficiary (+): it represents the first component of the target value (i.e. number of individuals who received socio-ecological/socioeconomic services and activities)
- 9 Empowerment (+): the act of involving a local community in the provision 'delivery' of socio-ecological/socioeconomic services and activities (i.e. matter of capacity-building)
- 10 Polarization (-): the act of unbalanced return of income 'benefit' on one of the components of a local community due to unbalanced provision 'delivery' of socio-ecological/socioeconomic services and activities by local nonprofit/for-profit stakeholder from a social, demographical and geographical perspective
 - a individual(s)
 - b group(s)
 - c family(ies)
 - d clan(s)
 - e tribe(s)
- 11 Conservation (+): the level of impact on natural-cultural resources caused by the socio-ecological/socioeconomic services and activities provided-delivered by a local nonprofit/for-profit stakeholder
- 12 Cultural absorption (+): the ability of a local nonprofit/for-profit stakeholder to realize the natural-cultural context of the area-region

of interest (i.e. due to the relative infeasibility of cultural quantification, this indicator refers to the involvement of local practices and knowledge in the realization and fulfillment of needs)

As an initial final result after assembling the sub-results of correlations (I), (II) and (III), the following is addressed by the modified QFD approach:

- 1 weight and relevance of stakeholders to issues of interest (i.e. *importance weighting 'IW' I*)
- 2 accountability of the local nonprofit/for-profit stakeholders in the High Mountains of Sinai Peninsula (i.e. master-indicator under modification; *importance weighting 'IW' II*)
- 3 level of importance of each set of the issues of interest for the local community (i.e. under modification)
- 4 competitive position of the economical transition phase (f)⁵⁰

3.7 Conclusion

There is no doubt that the Egyptian National Reforms Revolution of January 25, 2011 CE is a stunning and surprising historical event which came shortly after the Tunisian National Revolution, both marked by the collapse of the Tunisian and the Egyptian regimes on Friday, January 14 and Friday, March 11, 2011 CE respectively. The Sinai Peninsula Research 2000-2013 CE 'Phase I: survey phase 2000-2008; phase II: analysis phase 2010-2013 CE' is a reel time model which reflects the high instability, unrest and uncertainty in the Middle East and Worldwide (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c). There is no doubt that the responsibility of misconduct is shared by both the Western governments and their Middle Eastern counterparts.

Regarding the High Mountains of Sinai Peninsula, by following the final results of the 'QFD', a great weight of the conclusion should be given to the economical transition phase (f), concurrently with phase (g); hence that the protestors' level of contribution varied dramatically

⁵⁰ the black line in Table 8 shows the level of fulfillment of the socioeconomic needs by the Egyptian government prior the Egyptian National Reforms Revolution of January 25, 2011 CE

nationwide (i.e. Arab Republic of Egypt) from mass demonstrations in cities such as Cairo and Alexandria to almost no action status in areas-regions like South Sinai Governorate, raising a crucial question about whether the level of local-regional demonstrations reflects the socioeconomic condition of the geographical area-region of interest, acting as an indicator for the misconduct or good-conduct of the local, regional and central governance?

The geographical setting of the evaluator between past and present economical phases relative to the already benefited socioeconomic services, not the future ones; it will be the main factor which controls his or her opinion (Shams, 2010b).

Several issues should be noticed, leading to an answer for the previously addressed question of January 25, 2011 CE:

- a socioeconomic setting of the area-region of interest
- b education level (i.e. knowledge and awareness)
- c resistance to change

Regarding (a) socioeconomic setting of the area-region of interest, and according to the correlation between timeline issues of interest and economical transition phases (i.e. correlation I), phase (f) obtained total points of 39/56 which is equivalent to 69.64%, preserving a stable level of socioeconomic condition 'sustainable development' over almost 30 years since Post Camp David Peace Treaty between Egypt and Israel 1979 CE '1983-Early 2000s CE' (i.e. competitive position II), compared to previous levels sustainable development of 11/56 points '19.64%', 12/56 points '21.42%' and 19/56 points '33.92%' during the previous economical transition phases (i.e. competitive position I). Although some issues of interest obtained strong-negative/negative marks during phase (f), these issues did not lead to a socioeconomic breakpoint which would drive the local community of the mountain range to demonstrate against the government.

These strong-negative/negative issues of interest could be concluded under the previously identified customized sets as follows:

- a Environmental - Natural Heritage '0/3 points - 0%': issue (2) Groundwater recharge rate (i.e. 10+ years drought period due to Global Warming was partially broken by March 1, 2009 CE snowfall, and the consecutive seasonal flashfloods in 2010-2013 CE;

in addition to the artificial substitute in the rural-urban village(s)-town(s): St. Catherine Waterline '4000m³ for the town of Katharina and W. Feiran')

- b Economy '11/16 points - 68.75%': issues (17) Herding, and (18) Charcoal production (i.e. both counted on the traditional supportive economical activity which declined in favor of the main economical activity and the rising supportive economical activity: Substitution Effect of governmental policies which is possibly subjected to Reverse Action due to post Egyptian National Reforms Revolution of January 25, 2011 CE)
- c Foreign Funds '2/5 points - 20%': issues (26) United States Agency for International Development 'USAID', (27) United Nations Development Programme 'UNDP', and (29) UK Department for International Development 'DFID' (i.e. all international sustainable development funds undergo cyclic lifetime; accordingly, these organizations might partially keep withdrawing their funds-projects due to the political circumstances post January 25, 2011 CE; these organizations might increase their incentives in order to motivate and drive the old-neo Egyptian regime to preserve the current socioeconomic policies under domestic-national reforms which would stabilize the Egyptian state 'most expected scenario with partially minor impact on the local community of the High Mountains of Sinai Peninsula', or these organizations would operate under totally different socioeconomic and political environment 'somehow excluded scenario')

On the other hand, several other issues of interest obtained positive marks which should be regarded with great concern, as these issues are highly threatened and subjected to the state of instability, unrest and uncertainty, compared to the issues which obtained strong positive marks. These issues could be concluded under the previously identified-customized sets as follows:

- a Environmental - Natural Heritage '0/3 points - 0%': issues (1) Biodiversity, and (2) Aesthetics
- b Demographic '1/3 points - 33.33%': issue (7) Monasticism (i.e. historical decline)
- c Economy '11/16 points - 68.75%': issues (16) Mountainous Agriculture, and (22) Trade (i.e. to be reinforced; partially

unjustified Substitution Effect of governmental policies, possibly subjected to reverse action due to post Egyptian National Reforms Revolution of January 25, 2011 CE)

- d Governance '18/20 points - 90%': issues (37) Law (i.e. to be reinforced; partially justified level of enforcement of civil laws, concurrently with the execution of the traditional-customary tribal law), and (47) Hospital (i.e. limited and basic clinical services)
- e Management and Monitoring - Capacity Building '2/3 points - 66.66%': issue (53) Scientific Research (i.e. based on a list of more than 2,000 references, several scientific fields are not efficiently covered and/or updated with partial exception to biodiversity and geology)
- f Micro Value '1/2 points - 50%': issue (55) Value of St. Catherine Natural Protectorate (i.e. issues (1) Biodiversity, (2) Groundwater recharge rate, (3) Aesthetics, (24) Cultural assets preservation state, and (38) Natural reserve, all directly impact the hardly immeasurable potential value which is to be quantified by environmentalists and ecologists)

It is important to emphasize on the calculation of the points 'percentage' of each transition phase. The numerator of the points is calculated as the sum of the issues of interest which gained strong positive evaluation by the local community (i.e. strong positive evaluation refers to the potentially realized socio-ecological and socioeconomic deliverables by the local community), while the dominator is the total number of the issues of interest.

Considering (b) education level (i.e. knowledge-awareness), South Sinai Bedouins showed during Post Six Days War 5th of June 1967 CE '1967-1983 CE' economical transition phase (i.e. geo-political cause) a tremendously high awareness and understanding for the tribal socioeconomic interest and the future geo-political context of Sinai Peninsula:

W. Feiran (major valley in South Sinai), August 1977.....And listen to me: the Egyptians -not only will they return (to Sinai Peninsula), but they will return and do more than Israel did.....The Americans will want the Israelis to return the Sinai to Egypt one piece after another, like they have started doing. Two or three years from now, maybe the border will cut us in the middle, between al-'Arish (most northern city in Sinai Peninsula) and Ras-Muhammad (southern tip of Sinai

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Peninsula), half of us in Egypt, half of us in Israel.....When I transcribed this dialogue in 1988, I am stunned by this exact political prophecy. The Bedouins of South Sinai relied on cheap transistor radios and were always restlessly scanning. Not all news was understandable because, aside from the static, it was read in Modern Standard Arabic, which they didn't fully understand. Yet they accurately predicted the political future of the Sinai (Lavie, 1991).

South Sinai Bedouins have not just proved that they were right about the manner of the Israeli withdrawal from Sinai Peninsula—five years prior the complete withdrawal on April 25, 1982 CE—but the Bedouins also proved to be right about their expectations about the rate of sustainable development, being implemented by the Arab Republic of Egypt over the next 28 years '1983-2011 CE' of total points in the mountain range of 39/56 - 69.64%, which is more than twice the rate achieved by the State of Israel, obtaining total points of 19/56 - 33.92% during the occupation of Sinai Peninsula, reflecting the position of both sides.

While considering (c) resistance to change, the local Bedouins experienced a long history—20th century CE—of instability, unrest and uncertainty which drives the isolated mountainous community to regard any kind unclear socioeconomic and/or political reform with great caution, especially while experiencing the highest rate of sustainable development—with all its drawbacks—ever witnessed by all existing generations for more than 80 years old living memory. As a result, the local community of the mountain range is unlikely to majorly demonstrate against the Egyptian regime in the foreseen future, unlike their northern counterparts. It is clear cut elaboration on Emanuel Marx's security maximization theory in practice (i.e. the tendency of the local Bedouin community of South Sinai to balance between profit and security maximization). The profit under this elaboration refers to the feasibly foreseen socioeconomic benefits of the Egyptian National Reforms Revolution of January 25, 2011 CE, while the security refers to the already realized socioeconomic deliverables which the Bedouins will sustain.

There is no doubt that the nonprofit and for-profit stakeholders represent both corporate and competitive positions, as the involvement in the process of decision making is not equally shared by different stakeholders. For corporate governance, all stakeholders would be foreseen as final beneficiaries, as individual contributors, major and/or

minor ones who receive margins equivalent to time and resources consumed in the competitive market (Porter et al., 1985). In practice, the modified version of the Quality Function Deployment 'QFD' approach would act globally as a local governance quantification sub-model in order to strengthen the corporate position of the nonprofit and for-profit organizations and marginalizes the competitive one; support a multilevel decision making process; provide a full-scale perspective for the socio-ecological, socioeconomic and conservation needs, proportional to the high necessity of continuous interval-based prioritization process for the activities of the nonprofit and for-profit organizations.

3.8 Future considerations

Actually, there was a need to control the booming number of tourists (i.e. eco-cultural negative impact) who were estimated to be 450,000 tourists in 2011 CE on G. Musa 'Mount Sinai', tremendously and unexpectedly declining to almost no tourists in early 2011 CE! It is too early to decide whether January 25, 2011 CE is an economical transition phase or not in the High Mountains of Sinai Peninsula. It is determined according to the rate of recovery and the shift in socioeconomic and conservation policies. Such circumstances might lead to a decline in the main economical activity and the rising supportive economical activity which highly depends on the same market of the main economical activity (i.e. local-regional eco-cultural tourism market); it might also be characterized by the rise of the traditional supportive-economical activity and a relatively considerable illegal economy. Despite the high negative socioeconomic impact of the current circumstances, such an unspecified period could act as an unexpectedly enforced shutdown opportunity in order to evaluate and reform the socioeconomic sustainable development and natural-cultural conservation policies.

The High Mountains of Sinai Peninsula is partially expected to undergo short-term economical shifts similar to the ones of early Post Camp David Peace Treaty between Egypt and Israel 1979 CE economical transition phase. Despite the high negative socioeconomic impact of the current circumstances, such an unspecified period could act as an unexpectedly enforced shutdown opportunity in order to evaluate and reform the socioeconomic sustainable development and natural-cultural conservation policies. One of the foreseen opportunities is to develop relevant industries and expand the market

of the rising supportive economical activity towards the domestic-national market, acting as a step forward towards the international market. It is also an opportunity to introduce new local resource-based industry(ies) such as the manufacturing of low price hardened wood form the bark of palm trees.

Under the circumstances post January 25, 2011 CE, all nonprofit organizations and projects which obtained low marks '1 point' for 'Dependency (-)' indicator-index are unlikely to deliver and/or fulfill any socioeconomic and conservation needs due to the relative unavailability of international funds upon which their establishment took place (i.e. 1 point 'unavailability of funds': MPA; CESA; EECA; BCC; RPME; MPCP). Additionally, all nonprofit organizations which are directly involved in the main economical activity will be highly neutralized for unspecified period of time due to the decline of eco-cultural tourism economy (i.e. SS). As a result, there are only four nonprofit organizations and projects which are likely capable to operate under the new circumstances. These organizations are MT, CFSS, SCF and FAN, all to be considered while regarding other indicators-indexes per each (Tab. 8):

- 1 MT obtained intermediate mark of 3 points for 'Conservation (+)'
- 2 FAN obtained intermediate mark of 3 points for 'Polarization (-)'
- 3 SCF obtained intermediate mark of 3 points for 'Integrity (+)' and low mark of 1 point for 'Empowerment (+)'

In global practice, the modified version of the Quality Function Deployment 'QFD' acts as a sub-model which integrates within a global one (i.e. Comparative Corporate Governance Model 'CCGM'). The CCGM model is founded on several multilevel sub-models similar to the QFD one; each represents a set of indicators-indexes which quantify a different set of relations such as environmental capacity 'profile' and ecosystem services. The CCGM model would undergo dynamic sub-monitoring process per each sub-model via a set of customized monitoring activities under predetermined time intervals (i.e. day-to-day, quarterly and semiannual), updating the input data of the sub-models and enabling a multilevel decision making actions (i.e. predictive/preventive); all under routine and breaking governance events at the locality of interest.

3.8.1 European Commission fund for nonprofit organizations 'phase II': funds allocation analysis

The EU-SSRDP concept note is used as a guide in order to orient the results of the Route Cause Analysis 'RCA'/Quality Function Deployment 'QFD' (i.e. equivalent to a pre-feasibility study) towards a set of recommendations, leading to a highly potential socioeconomic and socio-ecological impact model (i.e. equivalent to feasibility study).

The Concept Note must answer 4 sections in a maximum of 4 pages (each section must be answered on maximum 1 page - the font size cannot be smaller than Arial 10). Any Concept Note not meeting those basic requirements will be rejected without appraisal.

Please provide the following information:

- 1 Summary of the action
 - a Brief description of the proposed action
- 2 Relevance
 - a How relevant is your proposal to the needs and constraints of the target country(ies) or region?
 - b What are the problems to be resolved and the needs to be met?
 - c Who are the actors involved (*final beneficiaries, target groups*)?
 - d What are the objectives and expected results?
 - e What is the added value of the action (what adds the action by reference to (central or local) government action and actions implemented by non-state actors)?
- 3 Methodology and suitability
 - a What are the main project activities?
 - b Who will be your main implementing *partners*, what is the length of your relationship with them and how will they be involved in the project?
 - c How will the project achieve sustainability?
 - d Will it have multiplier effects?
- 4 Operational capacity and expertise
 - a What is the experience of your organization in project management?

- b What is the experience of your organization and your partner(s) of the issues to be addressed?" (Tab. 18 & 19) (SSRDP, 2006)

3.8.1.1 Recommendations

An EU Commission Fund for Nonprofit organizations (Phase II) is able to increase the number of final beneficiaries and/or tangible socioeconomic services in the High Mountains of Sinai Peninsula by investing in the infrastructure 'mountainous garden restoration', handicrafts centre(s), and public-use equipments, under a similar executive role similar to the one of Makhad Trust and the direct supervision-cooperation of St. Catherine Natural Protectorate.

- 1 importance of community involvement and consultation 'social capital': local entrepreneurs-groups, families and individuals of interest inhabiting the entire mountain range and its perimeter via asset-based approach towards a future perspective 'community-based solution'
- 2 infrastructure 'mountainous gardens restoration': involvement and the empowerment St. Catherine Natural Protectorate (i.e. tactic-strategic plan) in order to minimize any negative environmental impact and/or tangible heritage loss*****
 - a instant feasible action
 - environment
 - preserve the aesthetics of the natural-cultural landscape (e.g. the establishment of the water dams using local natural material)
 - prevent over consumption of groundwater (i.e. advice-based control for the drilling/geo-distribution of water wells)
 - tangible heritage loss
 - support an initiative to conduct a guideline for the reuse of tangible heritage (i.e. mountainous agriculture and irrigation system) due to a future potential expansion of the main and supportive economies based on market demand and/or potentiality of natural resources per archeological site (i.e. Byzantine monastic settlements) [Ministry of Antiquities, Ex-SCA: Supreme Council of Antiquities]
 - b future potential perspective

Table 18 Problem definition ‘status 2010-2013 CE’ (Problem Solving Technique: McKinsey & Company, 2010)

Basic question to be resolved:

How can the EU Commission fund increase the number of final beneficiaries (i.e. benefit-cost) and/or tangible socioeconomic services in the High Mountains of Science Peninsula? (Fig. 57-59)

Perspective/Context:

Situation:

Main economical activity:

- Eco-cultural tourism**
- Tourism services and natural-cultural resources conservation

Rising supportive-economical activity:

- Medicinal plants***
- Handicrafts****

Traditional supportive-economical activity:

- Mountainous agriculture***** (i.e. constant at low level)
- Herding (i.e. constant at low level)
- Charcoal production (i.e. very limited)

Extinct traditional supportive-economical activity:

- Hunting (prohibited by law)

Illegal supportive economical activity:

- Smuggling (prohibited by law)

Complication:

- National-international marketing for ecotourism and local products;
- Local-regional carrying capacity of natural-cultural

Key decision makers and stakeholders:

Direct:

- EU Commission regional representatives/decision makers
- Official employees of the state of interest (i.e. ministries ‘central’, governorate ‘regional’ and city council ‘local’)
- Final evaluation committee

Indirect influence:

- Local entrepreneurs (Bedouin Sheikhs and/or owners of local business)
- Private consultants (i.e. state consultancy business)

resources	
<ul style="list-style-type: none">- Two Bedouin-demographic components:i) Gebaliya tribe 'northern vicinity' (i.e. active governance role)ii) Awlad S'aed tribe 'southern vicinity' (i.e. relatively absent governance role)	
Criteria for success:	Scope of solution space:
<ul style="list-style-type: none">- Number of final beneficiaries: target groups, families and individuals- Number, variety and geo-distribution of tangible socioeconomic services and/or infrastructure projects*****	<ul style="list-style-type: none">- Capacity building- Social development- Public awareness- Cultural heritage- Environment and sustainable development
Barriers to impact:	
<ul style="list-style-type: none">- Local community trust in development projects (i.e. community resistance/motivation)- Relatively long-term marketing process for potential results- Level of expected future income (i.e. socioeconomic potential impact)	

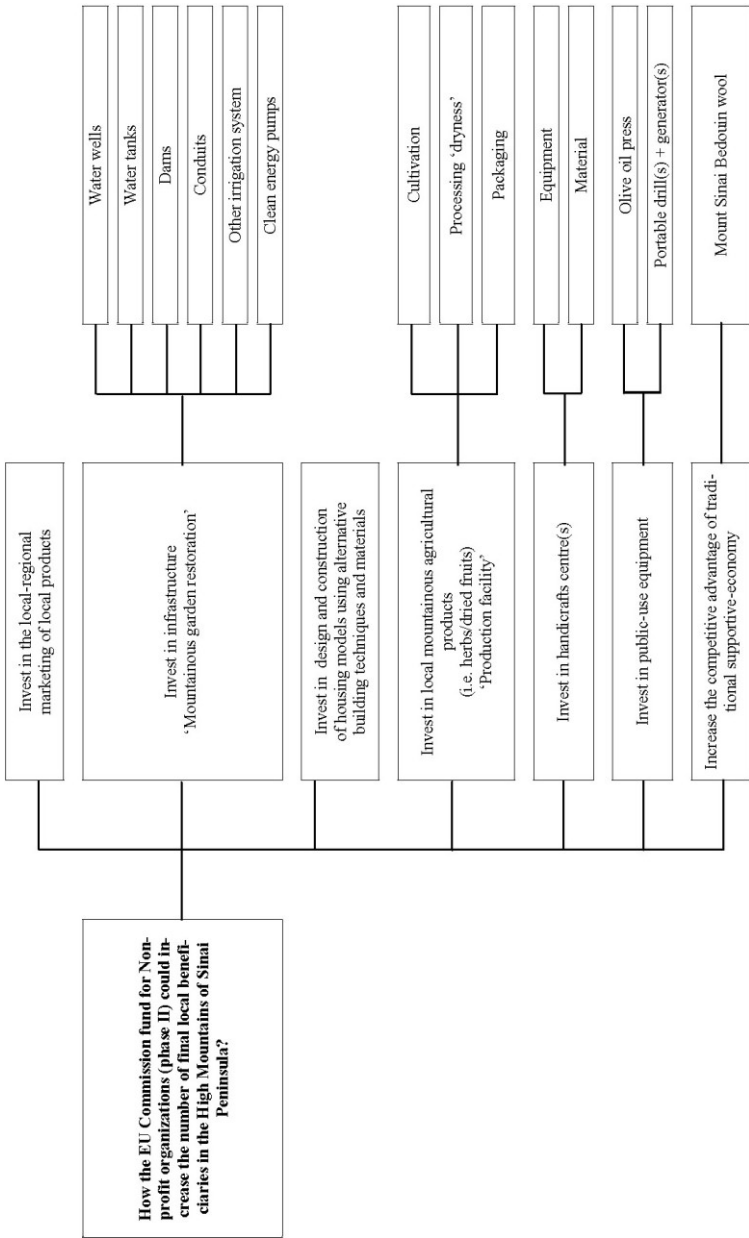
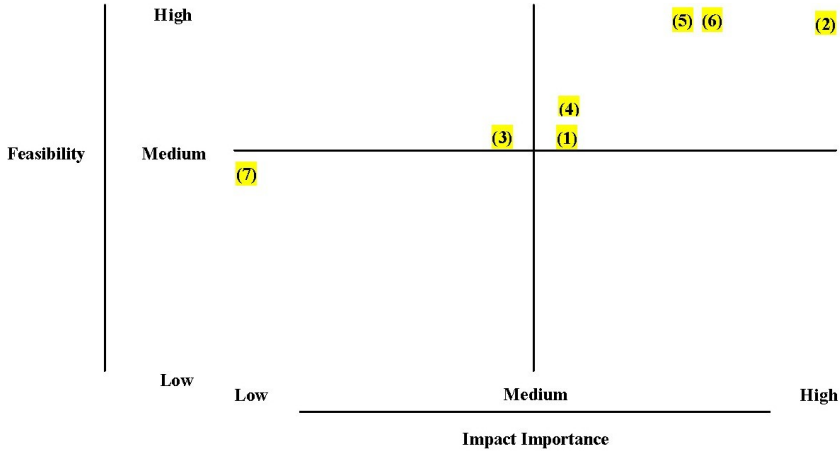


Figure 57 Issue tree 'status March 2013 CE' (Problem Solving Technique: McKinsey & Company, 2010)
(Note: the capacity-building will be executed as an on job training)

Towards A Quantification Model



Issues:

- 1 Invest in local-regional marketing of local products
- 2 Invest in infrastructure 'mountainous garden restoration'
- 3 Invest in design and construction of housing models using alternative building techniques and materials
- 4 Invest in local mountainous agricultural products (i.e. herbs-fruits) 'production facility'
- 5 Invest in handicrafts centre(s)
- 6 Invest in public-use equipments
- 7 Increase the competitive advantage of the traditional supportive economy

Criteria of prioritization:

- 1 Relatively long-term for potential impact (i.e. crucial)
- 2 Provides household economy with crops, ecotourism income and local mountainous agricultural products (i.e. herbs/dried fruits)
- 3 Relatively long-term for potential impact (i.e. important instrumental-intrinsic value)
- 4 Rising supportive-economy (i.e. geo-distributed facilities-stores)
- 5 Rising supportive-economy (i.e. geo-distributed facilities-stores)
- 6 Infinite number of final beneficiaries (i.e. one unit/function - purpose/settlement)
- 7 Requires further research for market impact

Figure 58 Prioritization of issues (Problem Solving Technique: Mckinsey & Company, 2010)

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Table 19 Issue analysis 'status March 2013 CE' (Problem Solving Technique: McKinsey & Company, 2010)

Issue	Hypothesis	Supporting-rationale	Analysis	Source
Invest in infrastructure 'mountainous garden restoration'	The investment potentially impacts household economy (i.e. crops, ecotourism economy and herbs/dried fruits)	<ul style="list-style-type: none"> - Infrastructure is positively perceived by local communities - Crops could be locally consumed during an economical crisis - Mountainous gardens act as an ecolodge-retreat for EU tourists - Gardens provide herbs and fruits for the production facilities of mountainous agricultural products - Feasibility of flexible activity expansion 'restoration' 	<ul style="list-style-type: none"> - National (i.e. local-regional)/ international market study for medicinal plants and tourism market - Geo-based needs assessment study for the mountainous gardens of Gebaliya-Awlad Sa'ed Bedouins in the High Mountains of Sinai Peninsula (i.e. northern vicinity/southern vicinity) - Consider Negev Desert, Avdat and Mashash farm projects 'best practice' and Gebel Al Akhdar Aflaj system 'best practice' (i.e. to be expanded as a full-scale case-study) 	<ul style="list-style-type: none"> - Local entrepreneurs: Mahmoud /Ahmed Mansur and Farag Fox - Local Bedouins (i.e. groups, families and individuals of interest) - Archive of international projects (i.e. UNDP Medicinal Plants Conservation Project, EU South Sinai Regional Development Program and SEAM Programme) + other publications - St. Catherine Natural Protectorate - South Sinai Governorate - Town of Katharina Council - The Holy Monastery of

Towards A Quantification Model

Invest in handicrafts centre(s)	<p>The investment potentially increases the Bedouin women income-share in household economy (i.e. home-based income)</p>	<p>according to the market needs</p>	<p>- Tuscan (Italy) traditional products 'best practice' (i.e. benchmark)</p>	<p>St. Catherine - Scientific research - BioMAP Project - Private sector (i.e. SEKEM)</p>
	<p>- Relevancy of producing handicrafts products in the remote Bedouin settlements - Feasibility of flexible low cost activity expansion 'production' according to the market demand</p>	<p>- National (i.e. local-regional)/international market study - Supply chain study between the town of Katharina, remote Bedouin settlements and national (i.e. local-regional)/international market</p>		<p>- Local entrepreneurs: Selema, Farag Fox, Sheikh Musa and Mahmoud /Ahmed Mansur - (+) all the above</p>
Invest in public-use equipments	<p>The investment will provide tangible socioeconomic services for the local Bedouin community⁵¹</p>	<p>- Similar equipments are not available in the High Mountains - Rising local need</p>	<p>- Geo-based needs assessment study for similar equipments</p>	<p>- Local entrepreneurs: Farag Fox and Mahmoud /Ahmed Mansur - (+) all the above</p>

⁵¹ The portable drill(s) for digging water well(s) should be used under the supervision of a local permissioning authority (St. Catherine Natural Protectorate) in order to limit the over consumption of water resources and/or illegal agricultural activities.

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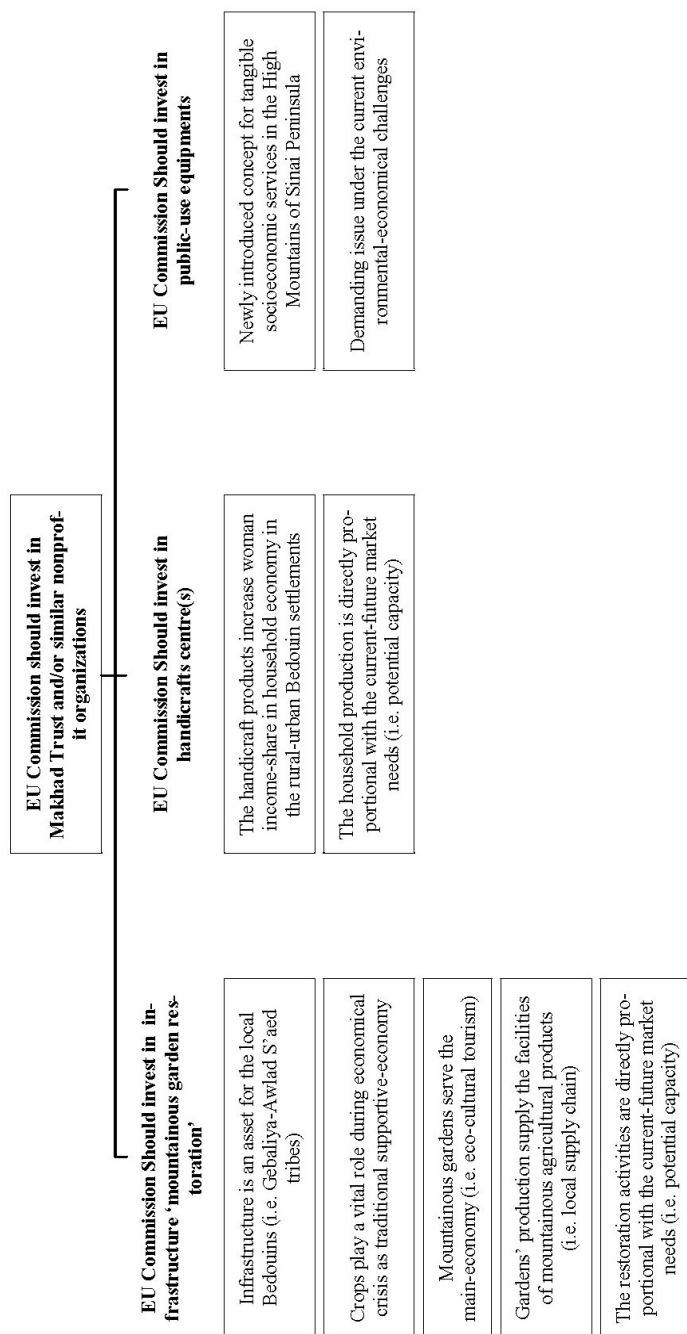


Figure 59 Synthesize findings (Problem Solving Technique: Mckinsey & Company, 2010)

Towards A Quantification Model

- environment
 - support an initiative to conduct a full-scale watershed management model for the valley-system of the High Mountains of Sinai Peninsula (i.e. the introduction of an efficient low cost model for water harvesting and groundwater pumping system 'site-location study for dams and water wells')
 - develop a set of indicators-indexes in order to economically quantify the intangible and tangible value of the natural resources of the High Mountains of Sinai Peninsula
 - introduce new local resource-based industry(ies) such as the manufacturing of low price hardened wood form the bark of palm trees
 - consider St. Catherine Natural Protectorate zoning plan
 - introduce a geo-based environmental risk-scale
- tangible heritage loss
 - consider the previously conducted archaeological surveys
 - develop a set of indicators-indexes in order to economically quantify the intangible and tangible value of the cultural resources of the High Mountains of Sinai Peninsula
 - develop a zoning system (A) to identify the elements of each archaeological site
 - develop a zoning system (B) to map the main and supportive economies (i.e. current activities/future perspective 'expansion')
 - introduce a geo-based tangible heritage risk-scale
 - develop an interactive digital guide/database for the Human Occupation Development in the High Mountains of Sinai Peninsula (i.e. municipal governance system)
- 3 others
 - a handicrafts center(s): networking and clustering is a crucial criterion to impact household economy in order to link the urban centre of the mountain range (i.e. town of Katharina) and the

satellite-cluster of rural settlements (i.e. geo-distributed of final beneficiaries)

- b public-use equipments: identify interrelation between community needs and required equipments
- c strategic action plan: all nonprofit organizations should follow the strategic action plan of the High Mountains of Sinai Peninsula (i.e. Integrated Cluster of Centralized Heritage-based Nano-economies)

3.8.1.2 A comparative corporate governance model 'CCGM'

But the question still stands, what level of governance model complexity is efficiently functional in order to implement and monitor the previously concluded recommendations? There is a need for a Comparative Corporate Governance Model 'CCGM' based on three integrated sub-models (Fig. 60):

- 1 the previously discussed newly modified timeline-based version of Quality Function Deployment 'QFD', addressing socioeconomic aspects/needs (i.e. issues of interest; domestic and global practice)
- 2 heritage-based arid/semi-arid watershed management model (i.e. a variant socio-ecological issue in domestic and global practice, determined upon the QFD socio-economic sub-results of a community's priority needs). Watershed management is a crucial and global socio-ecological need under climate change. The heritage economic-conservation and experimental archeology methodologies and techniques play a vital role in the conduction of low cost models:

Field experience has led the project to address watersheds more as geopolitical territories (defined on the basis of their governance and social dimensions) than as hydrological units (as in conventional watershed management initiatives) (Warren, 1998).

- 3 dynamic sub-monitoring model, enabling multilevel decision making actions (i.e. predictive/preventive); all under routine and breaking governance events at the site-area of interest; globally, mountain ranges are monitoring frontiers for global warming, being highly impacted and requiring dynamic adaptive approach towards increasing uncertainty

PART II

4. The environmental capacity of the High Mountains of Sinai Peninsula

4.1 The SinaiAlps project

SinaiAlps is a joint-research project by IMT Institute for Advanced Studies, Lucca, Italy (Management and Development of Cultural Heritage) in collaboration with European Research Academy 'EURAC', Bolzano/Bozen, Italy (Institute for Alpine Environment 'AlpEnv'). The project aims to conduct a Comparative Corporate Governance Model 'CCGM' at the High Mountains of Sinai Peninsula, based on three integrated sub-models:

- 1 newly modified timeline-based version of Quality Function Deployment 'QFD', addressing the socioeconomic aspects/needs
- 2 heritage-based arid/semi-arid watershed management model, identifying the environmental capacity of the mountain range and globally utilizing the DIAMONT-Alpine indicators in a global and different environment setting
- 3 dynamic sub-monitoring model, enabling multilevel decision making actions while formulating a neo governance structure and land use policy (i.e. predictive/preventive); all under routine and breaking governance events at the site-area of interest

4.1.1 The Alpine Convention and the DIAMONT project

The Alps rank among the most sensitive ecosystems in Europe....The Alpine Convention is an international Treaty for the sustainable development of the Alps. It was signed in November 1991 by the eight Alpine countries (Austria, France, Germany, Italy, Liechtenstein, Monaco, Slovenia, Switzerland) (covering an area of 190,568 km², while comprising 5,954 towns of 13.9 million inhabitants, in addition to 13,000 plant species and 30,000 animal ones) and the European Community....eight thematic Protocols have been adopted on spatial planning, nature and landscape conservation, transport, tourism, energy, agriculture, forests and soil protection. The Alpine Convention is also active in other essential sectors, such as population and culture, water and climate change....Despite stressing the necessity of intergovernmental solutions for common problems

there is always the risk that problems are changing in course of the ongoing elongated political processes....Indicators for a social, economic and ecological “fingerprint” of each municipality....Indicators are an approved tool for describing and evaluating the status and development of regions. For the DIAMONT project the indicators were defined, first, with special emphasis on Alpine-relevant basic information and secondly, with the aim of deepening knowledge on urbanization developments and sustainable land resource management....the pan-Alpine set of raw data was used to calculate 81 indicators for the municipal level. 41 of these were economic indicators, 26 social and 14 environmental indicators (DIAMONT, 2007, 2008).

Subjectively, the local socioeconomic aspects and needs of interest in any predetermined study-area integrate with the environmental context (i.e. stakeholder-based themes and sub-themes),¹ relatively without objectively reflecting the environmental capacity of the study-area of interest. Globally and simultaneously to any multidisciplinary indicators design process, the following issues are to be taken into consideration:

- 1 economic feasibility of the design process
- 2 availability (quantity) and reliability (quality) of data
- 3 subjectivity verses objectivity of indicators (i.e. anti data-driven)
- 4 customization verses standardization relative to the dynamics of the governance

Due to the lag in development and contextual complexity between the Alpine range and the High Mountains of Sinai Peninsula (i.e. there are no existing customized sustainability indicators for the Sinaitic range), reflected on the quantity and quality of data, and the socioeconomic and socio-ecological needs prior and post the Egyptian National Reforms Revolution of January 25, 2011 CE, in addition to the inefficient centralized governance system, the implementation of the DIAMONT social and economy indicators would be highly infeasible. The dynamics of the DIAMONT indicators are higher than the policies

¹ Currently, the indicator(s) per each theme is driven objectively and strategically according to the contextual definitions, or subjectively according to the declared capacity profile of the for-profit and nonprofit organizations relative to the contextual definitions which reflects the socioeconomic and socio-ecological needs.

on ground of the central government in Cairo (laws, regulations and structural pitfalls), causing a freeze in the monitoring process after the indicators' first iteration, characterized by high level of inaccuracy (i.e. relatively static state). The application of the DIAMONT social and economy indicators–standardization on the micro-local/municipality level–would take place post a proposed socioeconomic and socio-ecological leverage phase (i.e. 5-10 years; check Ch. 6).

Contrarily and currently, the DIAMONT environment indicators are feasibly applicable, mainly due to the consolidated land use status throughout the entire High Mountains of Sinai Peninsula, reflecting its strategic environmental capacity. It is crucial to highlight the fact that the environmental capacity of similar mountain ranges of consolidated human occupation development is represented more efficiently by land use patterns (i.e. socio-ecology; e.g. watershed supply-consumption modelling to indicate annual dynamics) than sole ecology indicators. In other words, the ecology indicators should be integrated with the socio-ecology/environment ones in order to identify and address the environmental capacity with high accuracy. As a result, the development models on the nano-household/family, micro-local/municipality and/or macro-regional/governorate levels in desert and mountain areas-regions without any precedent human occupation are subjected to accuracy risks (United Nations, 2007) (DIAMONT, 2008) (Shams, 2011a) (Shams, 2011b).

4.2 The environmental profile of the High Mountains of Sinai Peninsula

The DIAMONT-Alpine environment indicators identify five different environmental factors/phenomenon (i.e. equivalent to sub-themes), being measured by 18 indicators (DIAMONT, 2007) (Tappeiner et al., 2008).

4.2.1 Land cover

4.2.1.1 Palm grove areas (%) 'modified indicator of forest areas'

Palm groves areas are a landscape scattered feature with increasing density towards low-elevated valleys of the High Mountains of Sinai

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Peninsula. The northwestern and center-west vicinities are the most densely spotted by palm groves within the entire mountain range. The palm groves areas occupy an elevation range of 1000-1820m ASL (Fig. 11) (Tab. 20).

Table 20 Palm grove(s) pattern

Site/Location	Elevation ASL (meters)
Northern Half	
W. Abu Zeituna (5.2km)	1480-1520
Rotha area	1400
Sheikh A'wad Musa area and W. Gharba	1150
W. Naqb El Hawa (4.4km) 'palms between Anwatef and Madreby Sayef 'Ady areas'	center elevation 1380
W. Ginab 4.8km	1200-1350
W. Shagg Tinya, W. Tilah 'Rudhwah' and W. Bougiyeh 'Naqb Abu Sila' junction	1350
El Miliq area 'W. Tilah'	1400
W. Shagg Tinya	center elevation 1600
W. Sagar and W. Tinya junction	1750
O45 area 'W. Tinya'	1775
W. Shagg and W. Mathar 'Umm Khuraf' junction	1820
W. Tala'et Radwan 'from W. Madman junction to Tariq El Ashgar junction, including Farsh El Nakhil'	1200-1400
High Palm area 'W. Tala'et Radwan'	1400-1600
W. Rufeid 'lower-east Farsh Umm Hamat area'	1350

The Environmental Capacity

W. Rufeid 'Shlekha Region'	1500
W. Ithmid upstream area	1130
W. Baghbagh, W. Hilyian, W. El Bab El Masdud and Tariq El Ashgar junction-area	1100-1340
Tariq El Ashgar 'O339 area'	1540
Southern Half	
W. El Siq and Naqb Abu Zardab junction	1740
W. El Siq 'from W. Lo'da junction to W. Rahabieh junction, including Bab El Siq and El Siq Oasis'	1300-1600
W. Lo'da, W. Abu Zaharir and W. Mchera El Gharbi junction	1700
W. Tayiba downstream area	1000
Tayiba lower and upper springs 'W. Tayiba'	1250
El Kharita Oasis 'W. El Kharita'	1150
W. Zeraiqiya downstream area	1150
Naqb El Kharita	1600
W. Rimhan and Naqb Breika junction	1580
P278 area 'W. Rimhan'	1490
O554 area 'W. Rimhan'	>1490
Malag El Zalaqa 'W. Rimhan, Junction Wadi/Rimhan-Isla and W. El Tarfaa/Tarfet El Gamal junction'	1150
O556 area 'Junction Wadi/Rimhan-Isla'	1090
P273-north area 'W. El Tarfaa/Tarfet El Gamal'	>1200

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W. El Tarfaa ‘Tarfet El Gamal’ and Naqb to W. Kid Central Upstream Area	>1200
O547-south ‘W. El Tarfaa/Tarfet El Gamal’	1500
El Zea’a water well ‘W. Zera’a’	<1800
Routug Canyon - Bab El Routug	1700
W. Abu Seba, W. Rasis junction and W. Nasb ‘Gurerat’	1600

4.2.1.1.1 Functions

- 1 ecological
- 2 economical: dates as fruit, livestock fodder and cheep flour ‘outdated’; fronds as material for handicrafts and cheep timber for budget-economic furniture (i.e. quality/hardness to be improved by industry-based radiation accelerators). Wealthy Bedouin families introduce-cultivate new palm groves in their traditional-natural habitat, represented in the well watered low-elevated valleys (e.g. Feiran Oasis 45km to the Northeast of the High Mountains). None of new palm groves are being introduced within the perimeter of the High Mountains of Sinai Peninsula)

4.2.1.1.2 Threats

- 1 abandonment of traditional uses and maintenance
- 2 the long drought periods and over consumption of groundwater, exceeding the recharge rate and dropping the water table below the roots system with higher rate than the natural growth one, both result the decline in area and density of the palm groves (i.e. March 1, 2009 was the first snowfall event since 2002 CE, followed by other discontinuous events in December-January 2012-2013 CE; while January-February 2010 CE witnessed the first flashfloods in 10-15 years, followed by other discontinuous events in late/early 2011/2012 and–September–November 2012–2012/2013 respectively (Shams, 2011e) (El Shrouk Newspaper, September 29, October1-3, November 3, 2012, January 7/29, 2013).

4.2.1.2 Near-natural and natural open areas (%)

District 10. Upper Sinai Massif (1,500-2640m ASL): This district contains much granite, other magmatic and metamorphic rocks and wide valleys filled with arkose and alluvium. Small and large outcrops of smooth-faced rocks also occur. Lower altitudes of this district support vegetation only in wadis while that of upper altitude is of the 'diffuse' pattern.....the rock sequence is similar to that of the Lower Sinai Massif (500-1500m ASL), but with larger outcrops of smooth-faced rocks building up several mountain peaks. Springs and wells supply water for intensive agriculture in the valleys (Hadidi et al., 1970). Due to the higher amounts of available water, as a result of altitude, many more habitats are occupied by plants. Large outcrops of smooth-faced granite characterize several mountains of this district. Most of the area supports 'diffuse' vegetation (Danin, 1978) (Tab. 21).

Table 21 Geo-based 'selective/main valley-system' and endangered plant species surveys

Surveyed species (Guenther, 2005)

<i>Acacia tortilis</i>	<i>Deverra</i> sp.
<i>Achillea fragrantissima</i>	<i>Deverra tortuosa</i>
<i>Alkanna orientalis</i>	<i>Deverra triradiata</i>
<i>Anabasis</i> sp.	<i>Echinops glaberrimus</i>
<i>Anarrhinum pubescens</i>	<i>Ephedra alata</i>
<i>Andrachne aspera</i>	<i>Euphorbia peplis</i>
<i>Artemisia herba-alba</i>	<i>Fagonia arabica</i>
<i>Artemisia judaica</i>	<i>Fagonia mollis</i>
<i>Asclepias sinaica</i>	<i>Farsetia longisiliqua</i>
<i>Astragalus</i> sp.	<i>Ficus carica</i>
<i>Ballota kaiseri</i>	<i>Galium sinaica</i>
<i>Ballota undulata</i>	<i>Globularia arabica</i>
<i>Bufo multificeps</i>	<i>Gymnocarpus decandrus</i>
<i>Capparis sinaica</i>	<i>Gypsophila</i> sp.
<i>Capparis spinosa</i>	<i>Hordeum</i> sp.
<i>Caylusea hexagyna</i>	<i>Hyoscyamus boveanus</i>
<i>Centaurea scoparia</i>	<i>Hyoscyamus muticus</i>
<i>Chenopodiaceae</i> sp.	<i>Iphiona scabra</i>
<i>Chiliadenus montanus</i>	<i>Juncus</i> sp.
<i>Chrozophora oblongifolia</i>	<i>Kickxia aegyptica</i>
<i>Citrullus colocynthus</i>	<i>Launea spinosa</i>
<i>Cleome droserifolia</i>	<i>Lavendula coronopifolia</i>
<i>Cretaeus sinaica</i>	<i>Lindenbergia indica</i>
<i>Cruciferae</i> sp.	<i>Lolium</i> sp.
<i>Cynodon dactylon</i>	<i>Lotus</i> sp.

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<i>Malva sp.</i>	<i>Reseda sp.</i>
<i>Matthiola arabica</i>	<i>Retama raetam</i>
<i>Mentha longifolia</i>	<i>Schismus barbatus</i>
<i>Moricandia sinaica</i>	<i>Scrophularia libanotica</i>
<i>Nepeta septemcrenata</i>	<i>Stachys aegyptiaca</i>
<i>Ochradenus baccatus</i>	<i>Stipagrostis ciliata</i>
<i>Origanum syriacum-sinaicum</i>	<i>Stipagrostis obtusa</i>
<i>Panicum turgidum</i>	<i>Stipagrostis sp.</i>
<i>Peganum harmala</i>	<i>Tanacetum sinaicum</i>
<i>Phlomis aurea</i>	<i>Teucrium polium</i>
<i>Phoenix dactylifera</i>	<i>Thymus decussatus</i>
<i>Plantago sinaica</i>	<i>Trifolium sp.</i>
<i>Polygala sp.</i>	<i>Typha latifolia</i>
<i>Polypogon sp.</i>	<i>Verbascum sinaiticum</i>
<i>Pterocephalus sanctus</i>	<i>Zilla spinosa</i>
<i>Pulicaria undulata</i>	<i>Zygophyllum coccineum</i>

Endangered species (UNDP, 2002)

<i>Adiantum capillus-veneris</i>	<i>Glaucium arabicum</i>
<i>Annarhinum pubescent</i>	<i>Globularia Arabica</i>
<i>Bufoia multiceps</i>	<i>Hyoscyamus boveanus</i>
<i>Ballota kaiseri</i>	<i>Hyoscyamus pusiluns</i>
<i>Blepharis ciliaris</i>	<i>Hypericum sinaicus</i>
<i>Cleome droserifolia</i>	<i>Lindenbergia sinaica</i>
<i>Cotoneaster orbicularis</i>	<i>Moringa peregrina</i>
<i>Crateagus sinaica</i>	<i>Nepeta septemcrenata</i>
<i>Deverra triradiatus</i>	<i>Origanum syriacum</i>
<i>Ephedra pachyclada</i>	<i>Otostegia fruticosa</i>
<i>Euphorbia santae-catrinae</i>	<i>Papaver decaisnei</i>
<i>Foeniculum vulgare</i>	<i>Papaver rhoeas</i>
<i>Phlomis aurea</i>	<i>Silene schimperiana</i>
<i>Pistacia khinjuk</i>	<i>Solenostemm arghel</i>
<i>Plantago sinaica</i>	<i>Tanacetum santolinoides</i>
<i>Polygala sinaica</i>	<i>Thymus ducussatus</i>
<i>Primula boveana</i>	<i>Varthemia Montana</i>
<i>Pycnocycla tomentosa</i>	<i>Verbascum sinaiticum</i>
<i>Rosa arabica</i>	<i>Verbascum sinuatum</i>
<i>Salvia acetabulosa</i>	<i>Veronica islensis</i>
<i>Silene leucophylla</i>	<i>Veronica kaiseri</i>

4.2.1.2.1 Biodiversity

- 1 512 plant species (i.e. 316 recorded, 213 lost, 158 multipurpose, 102 medicinal, 47 potentials as medicinal, 37 endemic, and 9 veterinary medicine) (UNDP, 2002)

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- 2 25 mammal(s) species
- 3 50 resident breeding bird(s) species
- 4 100 species of migrating birds
- 5 36 reptile(s) species
- 6 Insects species, including 40 butterfly(ies) species (PAMU, 2003)

4.2.1.2.2 Habitat elevation range

- 1 Saharo-Arabian vegetation at 1000-1400m ASL (Perevolotsky et al., 1989)
- 2 Irano-Turania vegetation 'Central Asian Plateau' at 1600m+ ASL (Perevolotsky, 1981; Perevolotsky et al., 1989)

4.2.1.2.3 Functions

- 1 pasture 'all plants' (Bailey et al., 1981)
- 2 medicine (i.e. exposure to cold, heat, the rays of the sun, and dampness; infections from dust and dirt; digestive problems; bites and stings; women's disorders; natural disorders; anti-diabetic for slimming; dental pain; allergy; kidney failure) (Bailey et al., 1981) (UNDP, 2002)
- 3 veterinary medicine (i.e. intestinal parasites; mange; sore eye from scratch or blow; barrenness in camel; purulent sore on camel's leg; Swelling warm in camel's leg from sprain or fracture; aches/pains in camel's body; wolf bite)
- 4 food (i.e. plants whose stem, leaves or flowers are eaten fresh; plants whose bulb or root are eaten; mushrooms, truffles, and tubers; plants whose seeds are eaten; plants whose fruit is eaten raw; plants whose leaves are eaten cooked; plants from which bread is made; plants that serve as a dry dip; plants that serve as a condiment for clarified butter; plants that serve as a condiment for tea; plants that serve as a drink) (Bailey et al., 1981)
- 5 fuel wood (UNDP, 2002)

- 6 miscellaneous (i.e. parts of tents; household utensils; riding equipment; ritual; insect repellent; soap; leather dying; hair tonic; other) (Bailey et al., 1981) (UNDP, 2002)

4.2.1.2.4 Threats

- 1 Bedouin and tourists respect enclosure agreements
- 2 Bedouin recognize the benefits of cultivation
- 3 Demand are receptive to new medicinal plant products
- 4 Grazing agreements are recognized and adhered to
- 5 Livestock rearing incentives are not re-introduced by the government
- 6 Wild medicinal plant agreements are recognized and adhered to
- 7 The private sector has sufficient incentive to distribute butane and fuel-wood (UNDP, 2002)

4.2.1.2.5 Remarks

- 1 seasonal-regular mountainous orchards and agricultural plots in-use are excluded (i.e. permanent agricultural areas)
- 2 abandoned and semi-abandoned categories are included as semi-natural areas

4.2.1.3 Artificial areas

The topography of the High Mountains of Sinai Peninsula provides local areas (i.e. plains and valleys) of limited extent in order to develop the urban-rural settlements. Such plains and valleys are mostly concentrated in the northern half of the mountain range, where the settlements 'urban-rural' are clustered around the vicinity of Mount Sinai and the Holy Monastery of St. Catherine. The settlements (i.e. town of Katharina and its cluster villages) represent a very small land share.

4.2.1.3.1 Site and location

- 1 Inner plains: El Melga (i.e. Multiple and Intensive Use Management Zone 'MUZ') and El Raha (i.e. Protected Tourism Zone 'PTZ')

- 2 Low-elevated wide valleys at the perimeter of the High Mountains of Sinai Peninsula (i.e. Protected Tourism Zone 'PTZ'): W. Sebaa'iya 'major eastern geological fault' and W. Gharba, W. Sahab and W. Sulaf junction 'El Sheikh A'wad area' (PAMU, 2003) (Shams, 2011b, 2011e)

4.2.1.3.2 Regulations

- 1 multiple and Intensive Use Management Zone 'MUZ'
 - a low conservation value, highly impacted
 - b urban, quarries, tourism facilities, other commercial activities and protectorate service area
 - c development under restricted regulations (i.e. regulations by St. Catherine Natural Protectorate and the Environmental Impact Assessments 'EIAs')
- 2 protected Tourism Zone 'PTZ'
 - a moderate importance of biodiversity conservation
 - b restricted to the establishment of Bedouin settlements, camping sites and marked trails
 - c medium level of protection, minimum impact
 - d organized public access to natural areas for eco-cultural experience (i.e. tourism tangible benefit for local community)
 - e relatively high aesthetic carrying capacity (PAMU, 2003)

4.2.1.3.3 Settlements

- 1 urban area 'micro-economy center': town of St. Catherine (i.e. housing, commercial, household workshops, sports and leisure 'hotels/camps'; asphalt road-street network)
- 2 rural area 'cluster-satellite villages-settlements': No'amana; Arb'aïen; Seba'aiya; Zaytouna; Abu Zeituna; Khrazeen; El Raha; Abu Sila; El Sheikh A'wad (i.e. housing and leisure 'ecolodges')

4.2.1.3.4 Threats

- 1 loss of ecological function (e.g. cohesion of habitats)
- 2 high ecological pressure on adjacent transition zones (i.e. over grazing, groundwater contamination...etc.) (PAMU, 2003) Guenther, 2005) (Grainger et al., 2008)
- 3 expansion of rural settlements within the Protected Tourism Zone 'PTZ'
- 4 out of action nature reserve management plan 'St. Catherine Natural Protectorate'

4.2.2 Anthropogenic influence

4.2.2.1 Hemeroby

The anthropogenous influences are concentrated in the Multiple and Intensive Use Management Zone 'MUZ', represented in the town of Katharina, in addition to the adjacent valley system (i.e. Protected Tourism Zone 'PTZ'). The town of Katharina 'center-north' reflects high hemeroby value (7) (i.e. potential human impact), as it declines in value towards the perimeter of the mountain range with recognizable increases in the vicinities of sub-urban/rural (6) and mountainous orchards areas (5).

4.2.2.1.1 Hemeroby categories 'system'

- 1 first level: none anthropogenous
- 2 second level: (2-3) palm groves
- 3 third level: pasture
- 4 fourth level: agricultural plots (i.e. temporary/irregular cultivation)
- 5 fifth level: mountainous orchards (i.e. permanent seasonal agriculture)
- 6 sixth level: sub-urban/rural areas
- 7 seventh level: urban areas

4.2.3 Landscape diversity

4.2.3.1 Land-cover diversity of agricultural, near-natural and natural areas (n/km²)

The near-natural and natural areas are the dominating land-cover of the High Mountains of Sinai Peninsula, marked with scattered agricultural plots and mountainous orchards which are classified into the following (i.e. in addition to palm groves areas in the low-elevated valleys):

- 1 abandoned and semi-abandoned (i.e. irregular use is not equivalent to seasonal use)
- 2 in-use (i.e. seasonal-regular agriculture)

4.2.3.1.1 Remarks

- 1 seasonal-regular mountainous orchards and agricultural plots in-use are included as agricultural areas
- 2 abandoned and semi-abandoned categories are included as near-natural areas (e.g. pasture areas, agricultural plots and mountainous orchards)

4.2.3.2 Land-cover diversity of near-natural and natural areas (n/km²)

According to St. Catherine Natural Protectorate management plan, there are two types of sensitive habitat(s) zones within the High Mountains of Sinai Peninsula which fall under low or zero human impact conservation policy (i.e. Wildlife Sanctuary Zone 'WSZ' and Premium Wilderness Zone 'PWZ'), in addition to the abandoned mountain slopes and basins within the Protected Tourism Zone 'PTZ'. It is important to highlight that the management zones of the natural protectorate are set according to the contemporary land use and cultural-natural resources patterns, in order to minimize and/or avoid conflict of interest between the conservation-preservation activities and local-regional environmental and socioeconomic aspects (Tab. 22).

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Table 22 Number of mountainous orchards and agricultural plots in-use (Shams, 2011e)

Remote areas

- 100 families/300 orchards prior 1967 CE
- 30-40 families/100 orchards in 1970s CE (Hobbs, 1995)
- 20 families/20+ orchards in 21st century CE 'currently in-use' (Hobbs, 1995) (Matrahazi, 2010)

Site/Location	Number of Orchards	Code - Tur Sina Map 'TSM' (Shams, 2011e) Total Area (m ²)
Urban 'currently in-use'		
Town of Katharina	54+	1, 201-205, 215-219, 221-243, 246-258, 297- 299, 309, 583-585
Rural 'currently in-use'		
No'amana	1+	433
Arb'aïen	7+	313, 316-320, 322
Seba'aiya	33+	467-475, 438-461
Zaytouna	7	423-425, 476-479
Abu Zeituna	----	----
Khrazeen	----	----
El Raha	10	267-276
Abu Sila	28+	259-266, 278-296, 586
El Sheikh A'wad	6+	575, 594-597, 600
Ancient-contemporary monastic 'currently in-use'		
Dier Raheb 'Cosmos and Damian' at W. Tala'a El Saghera	3+	211, 213-214
Dier Fukarra 'Habash' at W. Tala'a El Saghera, W.	3	70-72

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Quweiz and W. Tilah ‘Rudhwah’ junction		
Dier El Raba ‘Holy Apostles/Twelve Gitirabbi’ Monks of in El Melga Plain at W. Arba’ien ‘Leja’, W. Umm Sid and Naqb Abu Gifa junction	1	220
Dier El Bustan ‘Theotkos/Virgin Mary’ in El Melga Plain	2	224-225
Dier El Arba’ien ‘Forty Martyrs/Holy Mary of Mercy’/Arselaus at W. Arba’ien ‘Leja’	2	315, 321
Hajar Musa ‘Moses Rock/Birth of the Holy Virgin’ at W. Arba’ien ‘Leja’	1	314
Hajar El Gidar at W. Arba’ien ‘Leja’	2	310-311
Farsh Elijah ‘Elias’	1	331
Farsh El Humar ‘Panteleimon’	1	330
Farsh El Sefsafa ‘Holy Girdle of Virgin Mary’	1	327
El Ma’nan ‘Galeomana’ at W. El Dier ‘Holy Valley’	1	333
Holy Monastery of St. Catherine at W. El Dier ‘Holy Valley’	4	334-337
El Magaf El Watia at W. El Dier ‘Holy Valley’	1	338
Zeituna Area at El Rahaba	1	534

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Plain		
Dier Rimhan 'Arselaus' at W. Rimhan and Naqb Breika junction	1	551
(Total)	191	----

4.2.3.2.1 Regulations

- 1 Wildlife Sanctuary Zone 'WSZ'
 - a free interaction of ecological factors
 - b no infrastructure and/or construction
 - c high level of protection, zero impact status
 - d existence of all flora/fauna in a natural status
 - e prohibition of feral species
 - f non-manipulative scientific research; removable scientific facilities
 - g no public access, none permitted (i.e. except for Bedouins' traditional ceremonies, pilgrimage...etc.)
 - h none permitted development
 - i G. Katharina (i.e. habitat of the largest number of endangered plant species) and G. Thabt
- 2 Premium Wilderness Zone 'PWZ'
 - a natural area of high potential value
 - b no infrastructure and/or construction
 - c high level of protection, minimum impact
 - d low density and high value eco-cultural tourism below the ecological carrying capacity (i.e. tourism tangible benefit for local community)
 - e transit corridors for limited number of tourists (i.e. numbers, group size and number of groups per area, in addition to traditional practices)
 - f none permitted development

g G. Umm Shaumar vicinity (PAMU, 2003)

4.2.3.3 Land-cover diversity of agricultural areas (n/km²)

There are 623 mountainous orchards and 351 agricultural plots which are scattered throughout the mountain range (Shams, 2011e). Additionally, the reused abandoned settlements are considered as mixed sites (i.e. temporary-abandoned settlements). The abandoned settlements 'ancient sites' are classified into 73 archeological sites (Dahari, 2000) and 54 newly recorded ancient sites (Shams, 2011e) throughout the mountain range (i.e. the majority are Byzantine monastic settlements, mostly including agricultural areas).

As a result of the high heterogeneity/variance of the mountainous orchards construction in terms of nano ecological capacity, represented in water and soil, the size of the orchard–area (m²)–does not reflect the production size.

Accordingly, the agricultural products–mainly fruit trees–till nowadays are Apricot 'sum of two varieties' (first half of June), Apple 'sum of five varieties' (end of June), Peach and Fig (beginning of July), early Grapes (mid July), Fig, Plums 'sum of three varieties' and Grapes 'sum of three varieties' (end of July - beginning of August), Almonds 'sum of two varieties', Pomegranates and Apples 'sum of five varieties' (August), Pear 'sum of 6 varieties' (end of August), Quince (September), Red Grapes and winter Apples 'sum of five varieties' (October), and winter Pear (end of October and beginning of November). In 1970s CE, 50% of the orchards grew seasonal vegetables and other crops such as Tomatoes, Tobacco, Pumpkin, Mulukhaih, Rijlah, Watermelon, Onion, Eggplant, Fava Bean, String Bean, Cantaloupe, Red Pepper, Mallow, Basil, Purslane, Spearmint, Rosemary, Prunes, Quince, Zucchini, Sorghum, Guava, Carob, Orange, Lemon, Olive, Date, Wheat, Corn and Walnut; in addition to Avocado, Aubergine, Jujube, Courgette, Mulberry, Alfalfa, Okra, Lettuce, Parsley, Pea, Pepper, Cress, Rocket and Spinach (Perevolotsky, 1981) (Hobbs, 1995) (Zalat et al. 2008) (Shams, 2010a, 2011e).

4.2.3.4 Patch density of agricultural, near-natural and natural area (n/km^2) and patch density of near-natural and natural areas (n/km^2)

According to the available spatial data and plant diversity studies, the only distinguished patches are the mountainous orchards and agricultural plots, compared to the dominating near-natural and natural areas land-cover. It is considered under this indicator as one single patch, or multiple patches based on topographical features 'landforms' (i.e. gorges, slopes, terraces and ridges) (Ayyad et al., 2000), or different geological formations, soils and altitudes (i.e. various classification methodologies) (Tab. 23).

Table 23 Structural analysis: 11 soil-based habitat types are available '15 sites pilot-survey' (Mosallam, 2007)

Habitat	Structure	Habitat	Structure	Habitat	Structure
I	Stony	VII	Rocky	I/II	Stony Wadis
II	Weed of Cultivation	VIII	Moist Ground	I/III	Stony Granite
III	Calcareous	IX	Sheltered Cliffs	XI/I	Sandy + Rocky
IV	Granite	X	Marshy Places	XI/II	Sandy + Alluvial
V	Cultivated Waste Ground	XI	Sandy	XI/III	Sandy + Gravelly
VI	Wadi Bed & Terraces	I/I	Stony + Sandy	XI/IV	Sandy + Stony + Calcareous

4.2.4 Landscape fragmentation

4.2.4.1 Road density of major roads (m/km²)

As a result the complex topographical features of the High Mountains of Sinai Peninsula, centralized nano-economies, and St. Catherine Natural Protectorate management plan, the road density is only concentrated in the center-north area of the mountain range, connecting the town of Katharina (i.e. Multiple and Intensive Use Management Zone 'MUZ') and its cluster villages (i.e. Protected Tourism Zone 'PTZ'). The roads are classified under three categories:

- 1 first level: dirt tracks 'min. impact on habitat change' (0)
- 2 second level: local inter-settlement (1)
- 3 third level: regional (2) (Tab. 24)

Table 24 Current asphalt road(s) network

Site/Location	Zone	Total Length (km)	Elevation (m ASL)	Population/Traffic	Kilometric Signs
Regional 'FCR (2)'					
W. El Sheikh	PTZ, MUZ	9.4	1350-1520	4,880+/ 2003-04 CE individuals 'urban-rural' (SEAM, 2003-2004) 450,000? tourists/2010 CE (SSRDP, 2010b) 25 Greek Orthodox Monks/2003 CE (Shams, 2011e)	15, 16
FCR (2) Elevation	----	----	1350-1520	----	----

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Range					
(Sub-Total)	----	9.4	----	4,905+ locals 450,000? tourists	----
Local inter-settlement 'FCR (1)'					
El Melga Plain	MUZ	5.7	1520-1660	4,880+ individuals 'urban-rural'	13,14, 128, 129
El Raha Plain	PTZ	3.3	1550-1600	Sub-total: 582+/1998 CE (UNDP, 2002) El Raha village: 166 Abu Sila village: 247 Sheikh 'Awad village: 159	127
W. El Dier 'Holy Valley'	PTZ, SAP	<1	1520-1550	450,000? tourists/2010 CE 25 Greek Orthodox Monks/2003 CE Gebaliya Bedouins?	----
W. EL Sebaa'iya	PTZ	<1	1480-1500	165+/1998 CE EL Sebaa'iya upstream village: 165	----
FCR (1) Elevation Range	----	----	1480-1660	----	----

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(Sub- Total)	----	11	----	5,652+ locals 450,000? tourists	----
Dirt-track 'FCR (0)'					
El Raha Plain	PTZ	1+	1500-1600	166/1998 CE El Raha village: 166	----
W. EL Sebaa'iya	PTZ	8.5	1480-1700	93/1998 CE EL Sebaa'iya upstream village: 93	17
W. El Dier 'Holy Valley'	PTZ, SAP	<1	1550-1580	450,000? tourists/2010 CE 25 Greek Orthodox monks/2003 Gebaliya Bedouins?	----
W. Rasis 'Gurerat'	PTZ	5.7	1700-1720 'lowest curvature point 1600'	----	19
W. Routug 'abandoned'	PTZ	5.3	1600-2000 'highest curvature point 1920'	----	23
Naqb Abu Qirsh 'abandoned'	PTZ	3.3	2000-2400	----	59
Katharina Plateau 'abandoned'	PTZ, WS	8.1	2400- 2630+	----	60, 61
W. Zera'a	PWZ	10.3	1600-1800	----	26

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Rahaba Plain	PWZ	8.3	1600-1800	----	27
FCR (0) Elevation Range	----	----	1480- 2630+	----	----
(Sub-Total)	----	51.5	----	284+ locals 450,000 tourists	----
(Total)	----		----	4,905+ locals 450,000? tourists	----
(Overall Elevation Range)	----	----	1350- 2630+	----	----

4.2.4.1.1 Regulations

1 Guiding principles

The construction of roads into formerly inaccessible areas causes major ecological and aesthetic impacts. Road construction and subsequent maintenance cause:

- a physical and aesthetic impacts especially in difficult terrain
- b impacts on wildlife by cutting through habitats, disrupting behavior and leading to road kills by traffic
- c an increase in associated development and greater accessibility

2 road policy

Will be to limit road construction, i.e. the fewer roads the better. No roads will be allowed in Wilderness or Wildlife Sanctuary Zones and a full EIA (black code) will be required for any road construction within the Protectorate or its adjacent area. The Protectorate will seek to restore road lines of spoil tips resulting from maintenance and repair (e.g. broken asphalt) and in future enforce the removal of such spoil by maintenance contractors (PAMU, 2003).

4.2.4.2 Road density of all roads (m/km²)

As a result of the concentration of the asphalt road(s) network in a relatively limited vicinity within the High Mountains of Sinai Peninsula (i.e. center-north low-elevated valleys and plains), and the small population which inhabits the mountain range, factors such as average altitude, geomorphology (passes) and slope inclination play a minor role in the classification of the asphalt road(s) network, with exception to the Dirt Tracks (i.e. low traffic; min. impact on habitat change). Regarding the economic infrastructure and development, W. El Sheikh (i.e. regional) and W. El Dier 'Holy Valley' (i.e. local inter-settlement) represent the main axis of socioeconomic activity, connecting the mountain range (i.e. Mount Sinai and the Holy Monastery of St. Catherine) with the Red Sea resorts (i.e. tourism economical-belt).

4.2.4.3 Effective mesh size of agricultural, near-natural and natural areas (km²) and effective mesh size of near-natural and natural areas (km²)

The Effective Mesh Size is a neglectable indicator in the High Mountains of Sinai Peninsula due to the following:

- 1 complex topographical features with very limited vicinities for asphalt roads or dirt-tracks construction
- 2 highly centralized nano-economical activities (i.e. population) in the northern half of the mountain range
- 3 high restrictions by the St. Catherine Natural Protectorate on the establishment of new asphalt roads (i.e. currently in late 2012 CE post the Egyptian National Reforms Revolution of January 25, 2011 CE, the local authorities permitted the construction of two story apartment houses outside Multiple and Intensive Use Management Zone 'MUZ'. This action violates a long implemented construction code of St. Catherine Natural Protectorate and the UNESCO World Heritage Site 'WHS' status 'site no. 954' in order to fulfil the instant needs of the local community post the revolution instead of simultaneously preserving the aesthetic-based construction works).

4.2.5 Protected area

4.2.5.1 Sites of community importance

The High Mountains of Sinai Peninsula (i.e. max. length: 42; max. width: 17.5) (Shams, 2011b, 2011e) towers the vicinity of South Sinai Governorate (i.e. 31,272 square kilometers) (South Sinai Governorate, 2011), as the mountain range is located at the heart of St. Catherine Natural Protectorate which covers most of the granite mountainous triangle of South Sinai (i.e. 4,350 square kilometers) (PAMU, 2003). World Heritage Site no. 954 'St. Catherine Area - Cultural Landscape' covers the northern half of the mountain range 'The Ring Dike' (i.e. 641km²) (PAMU, 2003) (UNESCO, 2008). Accordingly, all the socioeconomic activities within the mountain range are subjected to a national and international legal frame. The Environmental Impact Assessments 'EIAs' are used as a biodiversity and natural heritage conservation and preservation tool.

4.2.5.1.1 UNESCO WHS No. 954 natural criteria

1. criterion (vii): to contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance
2. criterion (viii): to be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features
3. criterion (ix): to be outstanding examples representing significant on-going ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals
4. criterion (x): to contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation (UNESCO, 2008)

4.2.6 Settlement situation

4.2.6.1 Altitude of centre of settlement (m ASL)

The human settlements are concentrated in the northern half of the High Mountains of Sinai Peninsula, located at an elevation range of 1150-1750m ASL. As a result of 1970s mass tourism economical transition phase which caused a major change in the traditional migration cycle and the population distribution pattern, almost 80% of the population currently inhabits the centre-north vicinity of the mountain range (i.e. town of Katharina) at an elevation of 1590m ASL (i.e. centre of settlement). The majority of the urban-rural settlements of the High Mountains of Sinai Peninsula are roughly extended along a northwest-southeast axis (Tab. 25).

Table 25 Urban, rural and monastic settlements' pattern and population

Settlement 'Urban-Rural'	Elevation (meters ASL)	Population of 1998 CE (UNDP, 2001)	Location
El Sheikh A'wad	1150	159/1998 CE	Naqb Hawa, W. Gharba, W. Sahab and W. Sulaf junction
Abu Sila	1500	247/1998 CE	Naqb El Hawa, El Raha Plain, W. Bougiyeh 'Naqb Abu Sila' and Fari'a 'Sadar' junction
El Raha	1600	166/1998 CE	El Raha Plain
town of Katharina	1590 (range: 1520- 1660)	Total 'urban- rural': 4,905+ locals (SEAM, 2003- 2004)	El Melga Plain; El Raha Plain, W. Sharig, W. El Dier 'Holy Valley' and W. El Sheikh junction
Khrazeen	1520	43/1998 CE	W. El Dier 'Holy

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			Valley' and W. El Sheikh junction
Abu Zeituna	1480	----	W. Seba'aiya and W. El Sheikh junction
Zaytouna	1470 (range 1460-1480)	34/1998 CE	W. Seba'aiya and W. El Sheikh junction
Seba'aiya 'upstream'	1500	165/1998 CE	W. Seba'aiya
Arb'aïen	1750	47/1998 CE	W. Arb'aïen 'Leja'
Seba'aiya 'downstream'	1610	93/1998 CE	Siqqat Shagg Musa, Siqqat Frash Elijah and W. Seba'aiya junction
Mo'amana	1620	49/1998 CE	W. Abu Seba and W. Rasis 'Gurerat'
(Overall Elevation Range)	1150-1750	----	----

Population 'High Mountains of Sinai Peninsula'

Year CE	Population	Year CE	Population
4 th -7 th Centuries (monastic)	530-600 (Dahari, 2000)	1986	3,373 urban/rural? (UNDP, 2002)
1917	480 rural (Shuqier, 1917)	1994	4,603 urban/rural (UNDP, 2002)
1965	500 rural (Gohary, 1965)	1996	4,219 urban/rural? (SEAM, 2003-2004)

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1972	1,245 semi-urban/rural (Zalat et al., 2008)	1998	4,438 urban/rural? (SEAM, 2003-2004)
1981 (estimate)	2,000 semi-urban/rural (Dames & Moore 'USAID', 1979-1985)	2003-2004	4,880 urban/rural (SEAM, 2003-2004)
1982	3,269 urban/rural (UNDP, 2002)	2017	17,378 urban/rural (UNDP, 2002)
1985 (estimate)	Less than 5,000 by 2000 CE (Dames & Moore 'USAID', 1979-1985)	2020	20,000 urban/rural (SEAM, 2003-2004)

Number of Greek Orthodox monks 'High Mountains of Sinai Peninsula' (Hobbs, 1995) (Shams, 2011e*)

Year CE	Monks No.	Year CE	Monks No.	Year CE	Monks No.	Year CE	Monks No.
1000	300	1600	1	1845	25	1929	31
1336	400	1620	3	1871	28	1938	19
1384	200	1700	50	1888	30	1957	12
1435	50	1783	50	1904*	20	1964	17
1485	30	1793	50	1909	28	1975	12
1512	40	1800	28	1912	25	1983	14
1546	60	1816	23	1922	22	1989	12
1561	40	1838	21	1926	21	1993	15
1565	0	1844	18	1927	20	2003	25**

4.2.6.1 Artificial settlement area

The available rural-urban settlement area and its adjacent newly established mountainous orchards are under pressure due to the scarcity of flat/gentle 'land' slopes (Shams, 2011b), conservation-preservation policies of St. Catherine Natural Protectorate (PAMU, 2003), low environmental capacity (i.e. groundwater) (Grainger et al., 2008), and the relatively increasing population with a growth rate of 3%/year (UNDP, 2002); in addition to the lack of an expansion plan for rural settlements, crucially, for El Raha and Abu Sila villages at El Raha Plain which represents a biblical-historical landscape and a horizon for the Holy Monastery of St. Catherine. Private housing construction and land use regulations are relatively inefficient under the current land ownership status (i.e. Decree-law No. 14 of 2012, and Minister of Defense Decree No. 203 of 2012: check Ch. 6) (Shams, 2011e).

4.2.6.2 Conclusion

As a result of the application of the DIAMONT environment indicators on the High Mountains of Sinai Peninsula, the following are the overall recommendations based on the previously discussed DIAMONT environment factors/phenomenon:

- 1 land cover
 - a fronds-based products improvement research to be conducted in order to establish small-medium size workshop industries for local-regional socioeconomic needs (i.e. innovation and quality)
 - b palm grove(s) survey (i.e. density, sampling, analysis...etc.)
 - c plants diversity survey (i.e. frequency/density, natural productivity, diversity of soil seed bank, grazing pressure, economical feasibility under different functions 'medicinal/pasture'...etc.) (Danin, 1978) (Bailey et al., 1981) (Perevolotsky, 1981) (UNDP, 2002) (Zaghloul, 2008) (Zalat et al. 2008)
 - d investigate the application of a Corporate Business Model (i.e. industrial model 'collection/cultivation') (UNDP, 2002)
- 2 anthropogenic influence: check landscape fragmentation
- 3 landscape diversity

The Environmental Capacity

- a mountainous orchards and agricultural plots survey (i.e. groundwater availability, site/location 'soil analysis', product variety, productivity, economical feasibility, ownership status...etc.) (Danin, 1978) (Bailey et al., 1981) (Perevolotsky, 1981) (Zalat et al. 2008)²
- b hydrological study 'farmhouse-based' (i.e. recharge rate, lithology, lineament density, depth to water table, groundwater quality, drainage density, terrain slope...etc.) (Elewa et al., 2011)
- c investigate the application of Corporate Business Model (i.e. industrial model)
- d conduction of a soil-based habitat map for the High Mountains of Sinai Peninsula, towards a basic structural diversity map (i.e. vegetation patterns)
- 4 landscape fragmentation
 - a regarding Katharina Town Plan 2017 CE (i.e. Katharina 'St. Catherine Municipality'); it is potential to develop functional road classes for a full-scale socioeconomic sustainable development plan (micro-macro levels)
- 5 settlement situation: check landscape fragmentation³

Additionally, three different sets of sustainability indicators—social and economy—shown in Table 26 would be implemented on two development phases as follows in Table 26 (check Ch. 6):

Table 26 Optional application of three different comparative sets of sustainability indicators on two development phase

Phase	Set	Design	Standardiza- tion Level	Source
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Phase I: semi-decentralization '5-10 years': education and socioeconomic leverage

² As a result of the high heterogeneity/variance of the mountainous orchards construction in terms of nano ecological capacity, represented in water and soil, the size of the orchard—area m²—does not reflect production size.

³ Satellite imagery-based GIS database would be conducted for the High Mountains of Sinai Peninsula for further accurate application and analysis of DIAMPNT environment indicators (Shams, 2011e).

Human Occupation Development

Project/ municipal- oriented	Quality Function Deployment - QFD '1 st modification ,	Themes, sub- themes and indicators' contextual definition	Customized 'High Mountains of Sinai Peninsula'	Timeline- based approach
Phase II: micro-local financial resources decentralization 'full democratization'				
Project/ municipal- oriented	Quality Function Deployment - QFD '2 nd modification ,	Themes, sub- themes and DIAMONT indicators	Customized 'High Mountains of Sinai Peninsula'	- Themes and sub- themes: timeline- based approach - Indicators: DIAMONT
Nation-state municipal/ regional integrity- oriented	DIAMONT 'modified'	Modified; main trends– pillars– dimensions, factors/ phenomenon and indicators	Customized 'High Mountains of Sinai Peninsula'	Survey- based approach in all similar municipalit- ies (i.e. multi- disciplinary institutions/ experts)
References				
Trans-border municipal/ regional integrity- oriented	DIAMONT	Main trends– pillars– dimensions, factors/ phenomenon and indicators	Customized 'Alpine range'	Survey- based approach
Trans- national state integrity- oriented	United Nations 'UN'	Themes, sub- themes and indicators' contextual definition	Standard- ized 'Global'	Survey- based approach

5. Arid and semi-arid watersheds management: the experimental farms and representative catchments of the Negev Highland and the High Mountains of Sinai Peninsula

5.1 A need for an experimental farm and a watershed management model

Water is the weakest stone in Sinai's development foundation. An important early step is restoration of traditional water resources (Dames & Moore, 1979-1985).

Since Camp David Peace Treaty between Egypt and Israel in 1979 CE till the Egyptian National Reforms Revolution of January 25, 2011 CE, all the national and international organizations disregarded the remote water resources of the lowland patterns (i.e. low-elevated upland areas between 900-950 to 1550-1600m ASL) and highland ones (i.e. high-elevated upland areas between 1550-1600m ASL to mountain summits '2500+m ASL') for the following reasons:

- 1 decline of the traditional supportive-subsistence-economy (i.e. mountainous agriculture, herding, charcoal production and hunting) in favor of the mass tourism main economy over consecutive socioeconomic transition phases (Ch. 3, Tab. 3)
- 2 abandonment of the remote areas of the mountain range and the resettlement in easily accessible town and villages between 1150-1750m ASL in the vicinity of Mount Sinai, the economical center of the mountain range (Ch. 4, Tab. 25)
- 3 lack of any attempts to mass produce the agricultural products—including the medicinal plants—of the mountainous orchards in-situ at a semi-natural habitat and micro-climate conditions, concurrently with a perception for the micro value of the mountain range as the eco-cultural tourism revenue (PAMU, 2003)

- 4 lack of governmental initiatives¹ with a mindset which adopts relatively high cost models—hydrological/watershed management—due to local-regional governance sub-optimization, scientific fragmentation, and relative limited experience in the interdisciplinary-based sustainable development solutions for mountain ranges, all colliding with the economic feasibility of such an option (UNDP, 2002)
- 5 lack of meteorological and hydrological data due to the almost inexistence of intensity-recording and accumulation rain gauges, hydrometric stations, wind gauges, suspended matter samplers and other(s) (PAMU, 2003)²
- 6 underfunded research institutions and the negligence of scientific research-based solutions in the Arab Republic of Egypt on local-regional decision making governance level (Grainger, 2008)

¹ Since Camp David Peace Treaty between Egypt and Israel in 1979 CE, the economic development in the High Mountains of Sinai Peninsula followed Western-based initiatives and advices, including the water resources management and agricultural projects: i) Dames & Moore - USAID 'early 1980s CE' (i.e. proposed projects: No.1 Hydrogeological Investigation; executed projects 'very limited scale': No. 32 Network of Meteorological Stations, No.95 Land Reclamation, and No.105 Fresh Water Well for 20,000 inhabitants; partially executed projects: No.169 Initial Environmental Examination and No.173 Controlled Environment Agriculture); "The consultant's work was that of review and evaluation rather than feasibility analysis, although several feasibility analyses are recommended for future years." (Dames & Moore, 1979-1985); ii) EU-Commission '1996-2001 CE' (i.e. executed projects: St. Catherine Natural Protectorate Acacia Rehabilitation and Ecosystem Restoration, and Meteorological Stations 'two'; partially executed projects: Groundwater Analysis) (PAMU, 2003); iii) ICOMOS (ICOMOS, 2002) (UNESCO, 2008); iv) UNDP, GEF and GTZ '2002-2007 CE' (i.e. executed projects: Medicinal Plants Conservation Project, including greenhouse irrigation 'agro-water economy') (UNDP, 2002); v) EU-Commission and DFID '2003-2004 CE' (executed projects 'very limited scale': Water Resources Assessment for the South Sinai, and Agriculture, Animal Husbandry and Fisheries Assessment for South Sinai) (SEAM, 2003-2004); vi) EU-Commission '2006-2010 CE' (executed projects: Medicinal Plants, and St. Catherine Pipeline) (SSRDP, 2006).

² Unexecuted recommendation for Sinai Peninsula since 1960 CE (Butrus, Sinai Encyclopedia, 1960); two meteorological stations: the town of Katharina '1590m ASL' and the summit of G. Katharina '2642m ASL' (PAMU, 2003).

On the other hand, since the Medicinal Plants Conservation Project 'MPCP' in 2002 CE, followed by the European Commission 'South Sinai Regional Development Program - SSRDP' in 2006-2010 CE, the medicinal plants are one of the elements of the rising supportive-economical activities, as several nonprofit and for-profit organizations invested in its conservation and production (Ch. 3, Tab. 15, 16 & 17). Nevertheless, its market is highly dependent on the mass tourism economy. Fortunately, the Egyptian National Reforms Revolution of January 25, 2011 CE shed the light on the absence of any potential alternative market for the entire economical activities of the mountain range. The main, rising-supportive, and traditional economical activities are totally interdependent. With all the limitations on the competitive advantage and the national-international market opportunities, the medicinal plants are the most likely ecosystem service which would provide a relatively potential and independent household income share. Prior any further discussions about the mass commercialization of the medicinal plants, two core aspects must be investigated in practice:

- 1 agro-potentials (i.e. out of scope of this study)
- 2 semi-arid watershed management (i.e. water resources capacity)

Based on the previously discussed, a low cost semi-arid watershed management model should be designed to provide feasible socio-ecological and socioeconomic solutions:

What level of model complexity is appropriate?....In practice, however, the complex model often do not provide more accurate runoff predictions relative to simpler and less detailed ones....What are the major sources of uncertainty in runoff prediction?....the difficulties in deriving reliable long-term hydrological records in arid regions due to sparse populations, limited economic resources, harsh climate and infrequent hydrological events (Bahat et al., 2009).

As an answer to the nature of the model, Avdat experimental farm-documented/published best-practice case-study at Negev Highland-and other supplementary models provide the scientific

foundation for an experimental farm in the High Mountains of Sinai Peninsula.³

5.1.1 Avdat's historical background and location

The Arab Nabatean town Avdat (i.e. also known as Ovdad Oboda and Eboda, after the Nabatean King Obodas I 96-86 BCE) is located on a hilltop at an elevation of 648m ASL (Soviet Military Map 1:50 000, 1987), 80m above the surrounding landscape (i.e. Central Negev Highland). It was established in late 4th-early 3rd century BCE on the Incense Trade Route between Petra the capital of the Nabatean Kingdom—contemporary the Hashemite Kingdom of Jordan—and Gaza on the Mediterranean coast—contemporary the Gaza Strip, Occupied Palestinian Territories—at the Negev Desert. The Nabateans were firstly mentioned in history without any controversy in 312 BCE when the Seleucid of Syria managed to drive an attack against them, mounted by Antigonos I Monophtalmus (one of Alexander's greatest generals who became the king of a Hellenistic state) (Bourbon, 2000). Under the rule of the Nabatean King Malchus II (40-70 CE), Avdat was heavily attacked by the Saracens. In 1st century BCE-1st century CE, the desert town served as a Roman military border camp (i.e. camel corps); later Roman Provincia Arabia in 106 CE post the annexation of the Nabatean Kingdom on the hands of the Roman Emperor Trajan (98-117 CE). The town played a vital role as a desert agro-pastoralism center since the King Rabbel II (70-106 CE),⁴ flourishing in 2nd-3rd centuries CE. It served as part of the eastern defense system under Diocletian (284-305 CE), and a Christian center under the Byzantine Empire in mid-4th century CE (i.e. massive militia-based agro-pastoralism economy, extending over 300km² in the Negev Highland), as it was abandoned post the Arab conquest in 636 CE upon a destructive earthquake. It became totally ruined in 8th-9th centuries CE. Avdat occupies an area of 300x400m², representing a late Roman tower, burial caves, farmhouse, potter's workshop, military camp, acropolis, Nabatean temple, two churches, fortress, Byzantine dwelling caves, bathhouse, and a main street in the late Roman quarter, all built out of a locally quarried

³ Since 1950s-1960s, the government of the Arab Republic of Egypt introduced experimental farms in North and Central Sinai (i.e. unpublished case-studies) (El-Nasharty, Sinai Encyclopedia, 1960).

⁴ Ancient desert subsistence economy since 2nd century BCE (Ackermann et al., 2008).

limestone (Kedar, 1957) (Evenari et al., 1971) (ICOMOS, 2003) (UNESCO, 2003) (Ackermann et al., 2008) (Haiman, 2012) (Fig. 61).



Figure 61 Sinai Peninsula and the Negev Highland map of climate and agriculture experimental areas: Sinai Peninsula Research 2010-2013 CE/SinaiAlps Project 2011-2012 CE

5.1.2 An answer to old-new agro-pastoral desert settlements

Since the emergence of the State of Israel post the 1948 CE Arab-Israeli War, the security of the newly born state on the historical land of Palestine occupies its consecutive governments. An answer to the Security of Geography and Geography of Security is ever since on the agenda (RGS-IBG, 2012).

Over the past two decades, the trans-border studies are significantly restructured and reinterpreted under the influence of the geopolitical and socioeconomic interest of nations in globalization. The Climate Change and global environmental threats relatively diluted the concept of political borders in practice at some multinational economically unified zones. National identity and culture are still unresolved key aspects, exerting high pressure across the borders. The threats of the global economic crisis are reforming the global interest as well as the conceptualization of the national and global trans-border security. On one hand, the borderlines follow distinctive topography, creating natural and relatively cultural boundaries between nations; on the other hand, it emerges to cut a homogeneous geo-cultural unit. The global trans-border security has its implications on the national interregional security of one political unit 'state'. How to define a political border in terms of security? What are the various aspects which influence the dynamics of the transitional geographies? Thus, how to identify the flow and impact of the physical and human transition process?

Apart of the legitimacy and ownership argument in the Middle East (i.e. political consolidation)—along with unfortunate lack of unbiased potential final beneficiaries—the Labor Zionist answer to the security questions is Jewish Settlements. It is an imitative answer with a sharp spearhead:

Fossatum Africae (Southern Algeria and Tunisia, North Africa)....All along the fossatum are found many fortresses, fortified towers, terraced wadis, diversion systems, large runoff fields, runoff cisterns and villages, all this is an area which is completely barren (also along trade routes)....The fossatum was started by Roman emperor Hadrian (117-138 A.D.) and garrisoned by 'limitanei', i.e. soldier-farmers. Historically these could be regarded as the forerunners of Israel's soldier-farmers, the Nahal who settle in newly founded frontier-

kibbutzim....whenever the Romans ruled in North Africa and whenever the rainfall was insufficient and no other water source was available there was extensive runoff farming (Evenari, Berkofsky et al. ed., 1981)⁵

The development of the Negev (10,000km², 60% of the historical land of Palestine) has been among the goals of all governments of Israel, and its justification was based on (a) defense (b) population dispersion and (c) economic potential (commercial/semi-commercial)....The peace agreement with Egypt (Camp David Peace Treaty in 1979 CE) has considerably changed the prospects and plans for development in the Negev. The region's main advantage of huge land reserves has vanished with the need to secure large areas for defense purposes, for air bases, camps and training areas. This has brought to the surface and sharpened conflicts between potential uses of land-urban and industrial, recreation and parks, and defense....social, security, demographic and geopolitical aspects play an important part in the development decisions. And it is not easy task to order in their importance. One way to deal with the problem is to set some of the goals as constraints, e.g. population should be no less than a given number, or define a minimum quantity of land that would be allocated for defense. Then an economic maximization process should take place, subject to these constraints....Infrastructure for one use is enjoyed by all others, and road construction for military uses is certain to diminish the disadvantage of costly transportation for industry and other economic activities in the region (wave-effect development) (Regev, Berkofsky et al. ed., 1981)⁶

In 1911 CE, thirty seven years prior the emergence of the State of Israel, Ruhama is the first Negev settlement, established to answer the future needs of the Zionist state. Historically (e.g. Avdat) and contemporarily (e.g. kibbutzim), desert towns are characterized by five features:

⁵ Also known as dry or spontaneous farming (Haiman, 2012); the early similar systems date back to the Neolithic Period ($\pm 6,300$ BCE) (Bruins, 2012).

⁶ Regev argues about the integrative challenges dealing with semi-commercialization and/or commercialization process of low income subsistent desert population, depending on natural resources, highly variable water renewal and poor soil. Two main elements contribute to the marginal cost pricing of water: i) transfer: piping or transportation; ii) scarcity of alternative cost (i.e. brackish water-quality drawbacks/limitations-is more feasible than desalination option; conclusion: overall mixed solution) (Regev, Berkofsky et al. ed., 1981).

- 1 adequate and continuous supply of water
- 2 small and limited in population
- 3 single industrial or endeavor
- 4 special problems of providing adequate modern social services
- 5 absence of a rural hinterland (Weingrod, Berkofsky et al. ed., 1981)

Similarly, garrison centers depend for their continuity upon national strategies and decisions, and as these change, the centers may also recede into the 'ghost town' category (Weingrod, Berkofsky et al. ed., 1981).

5.2 Avdat experimental farm environmental setting

Soon after the foundation of the State of Israel in 1948 CE many scientists and investigators began studying the potentials of the Negev, since this desert area represented more than 60 percent of the new country (Evenari et al., 1971).

In summer 1959-1960 CE, the Avdat experimental farm⁷ was reconstructed under the supervision of Jehoshua Cohen of Sde Boker and the direct support of the Hebrew University of Jerusalem and Israel Prime Minister's Office (i.e. Ford and Rockefeller foundations' and other private funds), receiving the first flood on November 10, 1959 CE while the construction works still in action. In 1960-1961 CE, it was the first agricultural season. Avdat farm is an elemental answer to settle the desert under all the previously discussed aspects (Evenari et al., 1971) (Berkofsky et al. ed., 1981). It acted as an experimental archeology project (i.e. reengineering), reviving the old-neo runoff water harvesting, groundwater tapping, water economy, storage and mixed desert agriculture (i.e. semi-arid watershed management; modern husbandry economy Vs ancient agro-pastoralism).⁸

The Negev Desert is located between the Arabo-Nubian massif to the southeast-Precambrian (500Ma)-and the Mediterranean of the ancient Tethys Ocean-Paleozoic (544-245Ma)-in the north. Avdat town is

⁷ The research lasted between 1954 to 1985 CE (Shanan, 2000).

⁸ Based on the average position of dryland at the Negev Desert in 1990-2000 CE, Avdat falls within the arid zone/belt (Bruins, 2012), not the semi-arid one in 1960s-1980s CE (Evenari et al., 1971), as the hyper-arid zone/belt dominates the region during the drought periods (e.g. 1989-1990 CE) (Bruins, 2012).

located on an Eocene (56-34Ma) limestone plateau 'hard limestone hilltop and soft chalk foot' (i.e. Mid Eocene transgression) (UNESCO, 2003). Avdat farm is located to the south of the town (Kedar, 1957) (Evenari et al., 1971) (Evenari et al., unknown) (Tab. 27).

Table 27 Avdat landscape structure factsheet⁹

Aspect	Description/Value
Lithology	Reg, Conglomerate Hamadas 'Green Hamadas', filled with fossil remains of sea urchins and other animals 'detritic limestone' (i.e. rounded stones cover/fragments 'desert pavement', coated with a layer of desert varnish, desert lacquer or desert patina 'iron/manganese oxides, rich in copper and cobalt')
Morphology	Northeast → Southwest orientation/ downslope
Chemical composition of stones	Carbonates, glauconite (i.e. silicon, iron and postach), and quartz
Soil	Vicinity: brown, shallow, rocky desert soils 'brown lithosols', loessial and loessial gray desert soils 'loessial sierozems', mostly deposited during Late Pleistocene 'last glacial phase' (Avni, Hare ed., 2009) (i.e. immature, poor in organic matter, saline '0.5-3.5% total soluble salts', rich in gypsum '20-90% pebbles-gravelly', and storage capacity of 15-18%) (Evenari, Berkofsky et al. ed., 1981); Central Negev loess in wadi beds and depressions 'basins' (i.e. Aeolian-fluviatile nature), classified as a highly fertile soil (i.e. water holding capacity/rainfall) ¹⁰

⁹ The importance of the agro-ecological and agro-botanical land classification in the empowerment of the decision makers and stakeholders on deciding about the land use of the national land inventory, represented in different landforms (Zohary, Berkofsky et al. ed., 1981). Sediments per slope contribution should be taken into consideration (Shackak, Berkofsky et al. ed., 1981).

¹⁰ Storativity Coefficient (S): efficiency (%) of rock as a water storage medium = water available/volume of aquifer drained; Permeability (P) or Transmissivity (T): volume of water (m³)/section (m²)/time(s) ≡ rainfall infiltration and groundwater recharge Vs outflow and pumping processes. Sand and sandstone are the optimal mediums for economic outflow, as

- Erosion rate: 0.8mm/year¹¹
- Mechanical analysis of Negev Desert loess soil: 30% fine sand, 40% silt and 30% clay, with particle diameters 0.1-0.05mm, 0.05-0.005mm and less than 0.005mm respectively
- Farm: 0.9-1.5 to 2.5-3m deep; lime 26-46%; alkaline PH 7.8-8.2 'concentration of hydrogen ions in soil solution'; salinity 0.15% total soluble salts at large plots and 1-2.5% at microcatchments, both 1/α flood rate; field capacity 17-18% 'soil moisture' and wilting point 8-8.4% 'Sunflower test'

Avdat falls in the Sahara-Arabian Desert belt (Evenari et al., 1971) (Shackak, Berkofsky et al. ed., 1981) (Ackermann et al., 2008) (Avni, Hare ed., 2009) (Kidron et al., 2010) (Tab. 28):

Table 28 Avdat climate-vegetation factsheet

Aspect	Description/Value
Elevation	610m ASL
Koppen's climate classification	BWks 'desert', dry 'summer' and cold, mean annual temp. below 18.7°C, and warmest month above 18.7°C (i.e. mean annual, minimum and maximum temp., humidity and characteristics of dry season); average of 8 °C in winter and 26°C in summer (Bruins, 2012)

pumping and subsurface dams are used to decrease the outflow. The root zone provides a higher degree of storage capacity (Issar, Berkofsky et al. ed., 1981).

¹¹ Gully incision is a valley mainstream phenomenon—high erosion rate post the sheet and rill stages (Shanan, 2000), 1/α loess soil formation and moisture level 'holding capacity', α groundwater recharge rate and depth, marked by *Acacia Raddiana* tress below 700m ASL—occurs at loessial soils and alluvial sediments in the Negev Desert and other Middle East regions, to be calculated in terms of headcut material classification, catchment area upstream of headcut (km²), total retreat (m/t), average annual retreat (m/year), total eroded soil (m³/t), average annual eroded soil (m³/year) (ton/km²), total potential agricultural area lost (m²), and average annual rate of lost area (hectare/year). No runoff agriculture installations are located inside the gullies of the Negev Desert. The vegetation decreases gully incision rate, as its biomass below the gully head downstream is less than the upstream valley section/segment by 70-90% (Avni, Hare ed., 2009). At Avdat, the gully incision rate is 3mm/year/1-7ha '45t/km²/year' (Shanan, 2000).

Arid and semi-arid watershed management

Mean annual rainfall	Very low rainfall; 100mm/year 'rain season: October-April/May' (Bruins, 2012) (i.e. rainfall/storm events occur in winter season: December-February; 1960-1967 CE: average 101mm, max. 178mm, and min. 33mm; Quotient Variation: 5.3 'max/min.'; average: 16 rain days/year/Negev Highlands: 12 days > 1mm, 25mm/1 day/2 years; irregular/spottiness due to slope orientation and wind direction) ¹²
Annual dewfall	37mm/216 nights and 31mm/198 nights max./1964 CE at surface and one meter level(s) respectively, and 26mm/190 nights and 26mm/166 nights min./1966 CE at surface and one meter level(s) respectively, using Duvdevani Dew Gage (i.e. max. in September-November, and min. in April-May) ¹³
Evaporation	1700mm/year/open water surface (i.e. 3031.3mm/1960-1961 CE/Piche Evaporimeter; 2611mm potential evaporation/1981 CE/Class A Pan) and not more than gradually increasing 8-10mm/sealed soil 'crust surface' (Evenari, Berkofsky et al. ed., 1981) (Kidron et al., 2010 CE) ¹⁴
Precipitation-Evapotranspiration	Negev Highland: 0.07-0.04 P/EPT, arid region, ¹⁵ unlikely to support economically feasible

¹² Source of low intensity rainfall (< 15mm/h): Mediterranean; source of high intensity rainfall (30-120mm/h): mainly, tropical air masses across the Red Sea to the south 'Red Sea Depression' (Avni, Hare ed., 2009).

¹³ During the night, the latent heat flux towards the soil is min., resulting very small dew deposition (i.e. Hiltner dew balance method) (Ninari et al., 2002).

¹⁴ Evaporation rate from higher to lower: Top 'hill' > Southern Slope 'SF' ≥ Eastern Slope 'EF' ≥ Western Slope 'WF' > Wadi 'valley bed' > Northern Slope 'NF' at Negev Highland. Evaporation α elevation and wind speed, as slopes—average 20°-30°—and Wadi are less than Top by 14-23% respectively, where there is significance difference between NF and SF rather than EF and WF (i.e. NF:SF ratio differ in calculation using direct-beam shortwave radiation). Each of the sun and wind factors explains 45-50% of the evaporation rate. There is lack of standardization and scale in measurement methods (Kidron et al., 2010).

¹⁵ At dryland zones, the ratio between annual precipitation 'P' to annual potential evapotranspiration 'PET' amounts to hyper-arid < 0.05, arid 0.05 to < 0.2, semi-arid 0.2 to < 0.5, dry sub-humid 0.5 to < 0.65 (Bruins, 2012).

Human Occupation Development

index	agriculture relative to the semi-arid conditions (Bruins. 2012)
Solar radiation	195-201 Kcal/cm ² /year 'high'
Dryness index	43.9/1960-1961 CE (i.e. evaporation/rainfall 'annual')
Relative humidity 'R.H.'	40-60/50-55% 'low' ¹⁶
Thornthwaite moisture index	High potential evaporation; -40 to -60 'arid' (i.e. 100*surplus - 60*deficiency/need); rainfall, potential evapotranspiration under optimal water supply (i.e. soil + plants 'water lost/unit surface or unit weight, mg/g hr'), unconsidered variability
Ground temp.	Below freezing point/15-20 nights/year
Vegetation	Soil + climate: Irano-Turnian 'Asiatic steppe'-phytogeographic-belt, Pseudo-natural vegetation of weeds in uncultivated areas (i.e. poor Segetal vegetation); sparse and lack of trees (i.e. sand screens + soil fixation), in addition to lichens and algae; there are six main habitats at the Negev Highlands: i) hilltop; ii) slope (i.e. stones act as microcatchments/sink patches, trapping water); iii) depression or runnel in loessial plain; iv) loessial plain; v) loessial wadi; vi) gravelly wadi.

5.2.1 The aspects of desert runoff agriculture¹⁷

According to Evenari, Shanan and Tadmor, the ancient runoff agriculture systems are classified into three main categories:

- 1 Individual Terraced Wadis: it is composed of consecutive terraces (*Arabic: 'Agoum'*) built at right angle to a wadi, with an average of

¹⁶ Plant production in desert habitat is higher when dew and air humidity are the water sources, than soil moisture as the main source (Shackak, Berkofsky et al. ed., 1981).

¹⁷ In 1979-1990 CE, the Negev Emergency Survey by Israel Antiquities Authority 'IAA' had conducted high resolution data about the agricultural system-terraces-of the Negev Desert; additionally, the Ancient Desert Agriculture System Revived 'ADASR' GIS/GPS-based project was conducted in collaboration with Bar Ilan University (Haiman, 2012).

12-15m–rarely 40m–spacing¹⁸ and walls of 5-7 stone layers, average of 6-20m–rarely up to 40-50/200m–long,¹⁹ 2-2.5m thick and average of 60-80cm–rarely up to 1.8-2m–high. The elevation of the bottom of one dam and the tip of the next downstream are equivalent. The floodwater flows from one terrace to the next, trapping soil and water behind each, raising the groundwater and moisture level in the soil (i.e. subsurface water), while allowing desert agriculture and preserving landscape (Butrus, Sinai Encyclopedia, 1960) (Issar, Berkofsky et al. ed., 1981) (Shanan, 2000)²⁰

- 2 Groups of Terraced Fields with Farmsteads: it is composed of an extensive conduits network along the hillsides in order to collect the runoff water (i.e. water harvesting yield), and direct it downwards to a small wadi/tributary bed, flooding a farmstead. The farmstead²¹ is supplied by water via a catchment area, being subdivided by the stone conduits into sub-catchments where special openings allow the water of the wadi and the conduits to enter the farm. It consists of terrace fields with watering gates, division boxes and dropdown structures to control the irrigation process, surrounded by 1.5m high retaining walls, and a farmhouse with a cistern at one of the tributary banks.²² There is a directly proportional relation (i.e. water economy balance) between the size of the catchment area and the agricultural area (i.e. Ratio 'R' = area of catchment basin/area of cultivated field). The ratio of 100 Negev farms varied between 17:1 to 30:1, with an average of 20:1). In Avdat farm case-study, the annual runoff is 15-20% of the mean

¹⁸ Water dams are twice as high and twice as far apart. Storage dams rarely exist in the Central Negev Highland (Kedar, 1957).

¹⁹ Spillways of 30-60m, 3-8m, and 1m handle flows of 10-30m³/s, 1-5m³/s, and 1m³/s respectively (Shanan, 2000).

²⁰ In loess soil case, 1mm of water moistens 8-10mm of soil. Accordingly, the terrace height to the depth of soil ranges between 1:8 or 1:10. It takes 2-3 days for full infiltration (Evenari et al., unknown)

²¹ A typical farmstead is consisted of agricultural plots/terraces, water cistern(s), watch tower, winepress, threshing floors and small stone mounds–called Tuleilat el Anab–'discussed below' (Ackermann et al., 2008).

²² Water cisterns are also dug downstream below a gully head to benefit the mass runoff yield (Avni, Hare ed., 2009).

annual rainfall 100mm/year, amounting 10-20mm/year.²³ Therefore theoretically, one hectare catchment–10,000m²–yields a water volume of 100-200m³. Based on a 20:1 ratio, one hectare of cultivated field receives 2000-4000m³, in addition to 1000m³ of direct rainfall precipitation. In practice, the Negev experimental farm required 2000-3000m³/hectare/year, in addition to the 1000m³ of direct rainfall precipitation/year in order to grow feasible crops under desert climate and soil characteristics

- 3 Diversion Systems: it is the least common, located in the main valleys to divert mass flashflood to relatively large terrace fields (i.e. water dam: straight or convex upstream). The diversion system is an immense structure, reaching up to 400m long, 9m wide and 4-5m high, supported with channels of more than 1km long and 2-3m deep, as it raises the water into a conduit-channel which is connected to the terrace fields. In practice, although the watershed–drainage basin–might reach up to 27-53km², similar vast watersheds supply lower yield, compared to the small watersheds, besides the increasing heavy silting problems of the flashfloods (Kedar, 1957) (Butrus, Sinai Encyclopedia, 1960) (Evenari et al., 1971)

Actually, the type of the cultivated crop(s) determines the required runoff yield in terms of ratio between catchment basin to cultivated field. For example, a date palm groove requires 20,000-30,000m³/hectare/year/100 tress/10 tons of dates. Historically, wheat, barley, figs, grapes ‘vineyards’, olives, dates and almonds are among the most common crops at the Negev Highland.

Thus in the case of loess soil, the infiltration process undergoes three phases:

- 1 dry soil infiltration (mm/h), adequate and continuous supply of water–initial–which decreases rapidly in ½hr.
- 2 crust formation and constant infiltration

²³ At Hurvat Benaya, Northern Negev Desert, the Nari-rock outcrops–Middle Eocene Age chalk covered by calcrete crust–occur instead of the loess soil of the Central Negev Highland, yielding an annual runoff of 50-100% (i.e. high connectivity coefficient) (Ackermann et al., 2008).

- 3 impenetrable crust 'sealed surface' (i.e. max. saturation deficit) (Shanan, 2000)²⁴

Considering the Avdat farm, the initial and final infiltration amounts are 10-20mm/hr and 2mm/hr respectively. The intensity of rainfall–actual precipitation 'amount/depth' per time/duration–and frequency 'time intervals' (i.e. storm events) contribute to the total runoff yield. Size, shape, orientation, topography, geology and surface conditions of the watershed also contribute to the total runoff yield (i.e. sub-catchment(s)/slope(s) classification). Accordingly, ½hr. rainfall at Avdat yields 6-8mm/hr '3-4mm of rain', while 1hr. and 10hr. rainfall at Avdat yields 5mm and 15mm of rain respectively. Rarely, 24hr. rainfall yields 20-25mm. By experimenting 20 runoff plots of 4 different slope degrees (i.e. 10°, 13.5°, 17.5° and 20°)²⁵–20m long downslope and 4m wide, with earth embankment of 10-15cm high and 20cm wide–for five different categories:

- 1 Control: natural surface
- 2 Bare: removed stones and rolled surface
- 3 Mounds: conical heaps of removed stones of 80cm diameter and 70cm high
- 4 Bare Rolled: removed stones and rolled wet surface
- 5 Mounds Rolled: conical heaps of removed stones and rolled wet surface²⁶

²⁴ Runoff is a result of loess soil crust formation–soil protection against erosion by wind and water–not soil saturation (Lavee et al., 1997) (Zaady et al., Hare ed., 2009), while at the Nari-rock outcrops, both the crust formation and/or the shallow soil saturation cause the runoff event (Ackermann et al., 2008); agricultural fields of high clay content soils outside nature reserves are chemically treated (e.g. sodium salts, silicones, latexes, asphalt, wax...etc.) to break the crust surface into small particles, sealing the soil pores and cracks for higher runoff yield (National Academy of Sciences, 1974).

²⁵ Area-slope modeling method (Meirovich et al., 1998).

²⁶ Negev Desert researchers argued about the function of the stone mounds–also known as contour catchments, 15-25m spacing–as they concluded that those thousands of conical heaped stones result bare slopes which increase the runoff yield by 250% compared to the uncleared surfaces (i.e. embedded stones are left untouched to act as a crust) (Evenari et al., 1971) (Lavee et al.,

The researchers concluded the following:²⁷

- 1 the slope in terms of soil depth, stone cover and micro vegetation 1/ α runoff yield, hence that sink patches act as depression storage, vegetation 1/ α slope degree, soil thickness α infiltration, and steepness α runoff yield²⁸
- 2 bare surfaces–rock outcrops–and crust formation α runoff yield (Evenari et al., 1971)

5.2.2 Avdat experimental farm in practice

The dry stream bed zone. The central (Central Negev Highland) and especially southern Negev is cut by an enormous net of rather shallow and broad wadis, extremely rich in tributaries. These dry wadi beds are the only sites supporting vegetation, sometimes even arboreal. The sum total of this furrowed land mass is estimated to compromise no less than a million dunams (100,000 hectares) which through appropriate hydro-technical planning could somehow be agriculturally utilized. It is a question of harnessing floodwater and of water collection, which are not easily carried out. But as it is, it forms an ecological zone of its own and displays peculiar potentials....The green Hamada....These extensive ridges and hillsides not only feed their adjacent valleys with runoff water, but sustain a rather interesting plant world of their own. Occupying over thirty percent of the surface of Israel's deserts, this is the mainstay Israel's desert settlement (Zohary, Berkofsky et al. ed., 1981) (Tab. 29).

Table 29 Avdat experimental farm factsheet

Aspect	Value
Drainage basin 'watershed'/Catchments	
1 large catchment (mainstream valley)	Eastern: 345 hectares (3,450,000m ²)

1997), and increase the erosion rate and the accumulation of soil downstream at the farms, from natural rate of 0.8 mm/year to 32.8 mm/year (Kedar, 1957).

²⁷ Desert landscape is a mosaic of crust formations (i.e. source of soil, nutrients and runoff water for the surrounding vegetation), vegetation, stone-covered soil and bare rock outcrops (Zaady et al., Hare ed., 2009).

²⁸ Slope length 1/ α runoff yield. Accordingly, the water conduits along the Negev Highland slopes prevent higher infiltration rates in case of the upper runoff yield runs all the distance downslope to the agricultural plots (Lavee et al., 1997).

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7 small catchments (hillside conduits-channels)	Southern: 30.7 hectares (307,000m ²)
Catchment length (range)	200-840m
Catchment width (range)	25-150m

Annual average runoff/catchment (1960-61 to 1966-67 CE)²⁹

Catchment No.	Areas (hectares)	Max. (mm)	Min. (mm)	Annual Average (mm)
I	7	25.2	0.7	9.9
II	5.4	25.4	0.07	10.6
III	5.5	12.3	0.08	4.3
IV	3.1	15.8	0.9	5.3
V	1.0	18.9	1.6	9.5
VI	3.7	21.5	1.0	6.5
VII	4.3	22.6	0.4	7.6
VIII	345	13.1	0.1	2.4
Average/Catchment	----	----	----	7.7

Agricultural area

- Total: 12 hectares (120,000m²)
- Experimentally used: 2.8 hectares/14 terraces (26,000m²)

Ratio 'R' = area of catchment basin/area of cultivated field

Blocks no. 2-5	25:1 = southern catchment 30.7:1.2 agricultural plot
Blocks no. 8-14	215:1 = eastern catchment 345:1.6 agricultural plot
Rain gauges ³⁰	2 automatic + 17 other

²⁹ Tsin at Mapal Avdat hydrometric station: no. 55110, 233 km² watershed area, 43 observation years, 54 flow events, 87mm mean annual rainfall/observation years, 6.8m³/second median peak discharge/54 flow events, 551m³/second maximum peak discharge/54 flow events, 0.17 MCM 'million m³' median volume/54 flow events, 6.02 MCM maximum volume/54 flow events, 130 mean (day, early January), 58 standard (day) and 0.43 skew arrival time–September, 1–of runoff events (Meirovich et al., 1998).

³⁰ Currently, two meteorological stations are located in the Central Negev Highland at Sede Hayil and Kibbutz Sede Boker (Bruins, 2012); since 1965 CE at Nahal Yael, City of Eilat–Southern Negev Desert–vicinity, there is a dense network—to overcome rainfall-runoff modeling uncertainty—of 13 intensity-recording and 42 accumulation rain gauges, 5 hydrometric stations, 2 wind

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Flood gage + Weirs at catchment-farm gate(s) ³¹	1/large catchment + 7/small catchments
Slope range	1°-70°
Soil	60% shallow and stony

Five objectives were set for the Avdat experimental farm:³²

(1) To set our theories of ancient runoff farming; (2) To collect data on runoff from watersheds and catchments of various sizes and to study the factors affecting runoff, including rainfall and watershed characteristics; (3) To determine which field crops, vegetables, fruit trees, and pasture plants could be grown successfully under conditions of runoff agriculture; (4) To study the water use of agricultural plants grown under desert climatic conditions; (5) To develop methods of applying runoff farming to modern desert agriculture (Evenari et al., 1971).

gauges—most dynamic erosion agent in arid and semi-arid regions—and 7 suspended matter samplers, as the gauges were replaced overtime by newer ones, subjecting the records to device-based variances. Recorded data of rainfall-runoff events: rain depth (mm), range—observed rain depth for events with more than one gauge data—(mm), rain intensity (mm/h), rain duration (min.), no. of gauge record/event (i.e. average 2-3 rain gauges/event), runoff volume (m³), and peak discharge (m³/s) (Bahat et al., 2009) (Zaady et al., Hare ed., 2009)

³¹ Currently, Israel Hydrological Service operates an extensive network of hydrometric stations for 4-47 years—average 18 years/station—and limited number of meteorological stations in the Negev Desert. Sediment Research Station operates dense network of rain gauges (Meirovich et al., 1998).

³² Remarks: a) Total volume of runoff water/catchment = annual average precipitation (mm) × 10 × hectares/catchment; catchment area (m²) 1/α runoff yield, as runoff yield/small catchments > runoff yield/large ones; b) aquifer 'groundwater/brackish fossil water' flow rate: i) high flow velocity: gravel and sand with 1° slope amounts to 10m/day; ii) slow flow velocity: gravel, sand, silt and loess soil with 1° slope amounts to 0.3-0.03m/day (i.e. Acacia tree as an indicator of groundwater); c) shallow water well: 3-6m deep yields up to 200-300 m³/day 'domestic and agriculture use', to be tapped-pumped at distant downstream area α moisture preservation (i.e. safe yield pumping α sustainable socioeconomic development); d) surface water storage: natural rock holes, cisterns—town, house/farmhouse, mainstream and hillside—for human and livestock supply, and artificial pools of surface area 50-100m² 'fish farms'; e) subsurface water: small pools of 20-40cm deep (Evenari et al., 1971) (Issar, Berkofsky et al. ed., 1981).

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Avdat experimental agricultural plan is compromised in the following:

- 1 pasture plants 'blocks no. 2-4', including 30 species of perennial range plants and 20 annual ones, grazed at 15-20cm high
- 2 field crops 'blocks no .8-9', including early flood(s) crops–winter–such as winter cereals, leguminous crops for forage, silage or seeds, biseasonal field crop, and vegetables, in addition to 4 late flood(s) field crops 'summer'
- 3 fruit trees 'blocks no. 10-14', including apricots '4 varieties', apples '4 varieties', almonds '9 varieties', sour cherry '2 varieties', sweet cherry '2 varieties', peach '4 varieties', pistachio '5 varieties', and vines '10 varieties'; in addition to
- 4 cash crops
- 5 medicinal plants
- 6 flowers
- 7 wild desert plants; all under standard agricultural practices (i.e. cultivation, fertilizing and pest control)

Hence, December is either late or early for both winter and summer field crops respectively. Field crops received manure 20m³/hectare, and 600kg of ammonium sulfate (21%) and superphosphate (16%), while pasture plants received superphosphate 400-500 kg/hectare/year and ammonium sulfate 200kg/hectare/3times/year. The optimum application of fertilizer is just before or during the flood, in both cases, it is impossible to predict the floods. Sowing takes place after first flood/season, at depth of 1-3cm for annual pasture. The farm has an Oasis Effect on the neighboring desert, especially during drought periods, attracting insects, hares, gazelles, porcupines and desert partridges. Water use (m³/crop-type/hectare) and crop yield (kg/hectare) determine the total water economy (kg/m³) in terms of fresh and dry matter, avoiding over irrigation, as it also determines the most adaptable and productive varieties/species under Avdat experimental farm environmental setting 'habitat' (e.g. time structure

of the environment: germination cycle; i.e. out of scope of this section).³³

Additionally, the water consumption of living beings is mainly determined by air temperature, body surface area and physical activity. Manpower amounts up to short-distant transfer of 0.5m³ stones/day, or the cultivation 0.5hectares/day. Regarding the Negev Desert:

- 1 human: max. 12liters/day, 7liters/summer-day and 2liters/winter-day, equivalent to 1.5 m³/individual/year
- 2 camel/donkey: 4-5liters/summer-day and 1-2liters/winter-day, equivalent to 1m³/camel-donkey/year (i.e. 30% body weight loss/drought periods; camel watering intervals: up to once/5-7summer-days and once/20-30 winter-days; production: wool 3kg/cut/animal and milk 10liters/day/animal)
- 3 sheep/goat: 2-3liters/summer-day, equivalent to 0.5m³/sheep-goat/year (i.e. Awassi sheep watering intervals: once/day/15-20km grazing distance; production: milk 100liters/year/animal); dog: 0.5m³/dog/year. Therefore, a typical desert household/farmstead consists of 6 individuals, 2 camels, 1 donkey, 10 sheep or goat, and 2 dogs consumes 18m³/year. In order to avoid overheating during summer days, a man, camel or dog requires 1, 1.5 and 2.5% of water/hr exposure out of its body weight respectively (Evenari et al., 1971) (Evenari et al., unknown)

5.2.3 The microcatchments of Avdat and Wadi Mashash farms

For efficient utilization of water resources (i.e. precipitation/runoff), the Avdat farm introduced 117 microcatchments with 15-30cm border checks, ranging in size and number. An initial experimental result concluded that smaller catchments yield higher runoff volume of water (Tab. 30):³⁴

³³ The water use of Closed System Agriculture saves up to 1/10 or 1/5, compared to an open field. *"Israel Patent No. was granted to E. Rappaport in 1952"* (Gale, Berkofsky et al. ed., 1981).

³⁴ 5mm rainfall generate runoff yield in small catchments, while it requires 10-20mm rainfall for larger ones; partially contrary to the Avdat experimental farm results—more accurate in practice—the runoff yield 'magnitude' α

Table 30 Avdat microcatchment runoff yield under 12mm rainfall on December 6, 1961 CE (Evenari et al., 1971)

Area (hectares)	Area (m ²)	Plots No.	Average Runoff/Plot (m ³)	Average Runoff/Hectare (m ³)	Runoff: Rainfall (%)
1/10	1000	6	4.34	43.4	36
1/20	500	15	2.47	49.4	41
1/40	250	50	1.03	41.2	34
1/80	125	14	0.38	30.4	25
1/160	62.5	8	0.21	33.0	27
1/320	31.2	8	----	----	----
1/640	15.6	16	----	----	----

It is remarkable to obtain a runoff/rainfall ratio of 25% min. to 41% max. under a 12mm precipitation, compared to an average of 15-20% for small watersheds. Avdat proved that the optimal microcatchment for a fruit tree is 200-250m². Consequently, the size of the microcatchment (microcatchments/hectare) is determined by the required m³/crop-type 'species/variety' which is controlled by the overall environmental setting of the farm. A wet ground due to a recent rainfall might yield up to 100% runoff under a consecutive rainfall (Evenari et al., 1971) (Evenari, Berkofsky et al. ed., 1981).³⁵

Wadi Mashash experimental farm 'Northern Negev Desert' utilizes the obtained experiences at Avdat and Shivta—another Nabatean town at the Negev Desert—experimental farms. Microcatchments' matrixes were designed—10-500 plots according to the topographical profile—with specifications of 255m² area/plot '17x15m' and 15-20cm high border checks, with a tree pit/basin downslope at one of the corners, 20cm deep and 12.25m² '3.5x3.5m'. Not all the

watersheds/catchments/drainage basins size up to 250-300km², while 1/α with the larger ones (Sinai Encyclopedia, 1960) (Meirovich et al., 1998).

³⁵ In arid and semi-arid zones runoff events are inconsecutive, rarely occurs after one another. The frequency and magnitude of a single event are the main runoff factors (i.e. event magnitude: peak discharge 'm³/s'—falls within the 95% uncertainty range—and total volume 'm³' under predetermined time intervals; e.g. 10, 25, 50, 100 years) (Meirovich et al., 1998) (Bahat et al., 2009).

microcatchments succeeded in growing the cultivated plants—average failure 10-15%—as it is caused by several factors:

- 1 soil structure characterized by low infiltration rate
- 2 damage by animals
- 3 salinity
- 4 infeasible precipitation location (i.e. 5kg cow dung/tree/1st year, 1kg urea/2nd year, and 1kg ammonium sulphate and super phosphate/3rd-4th years are applied as fertilizers, all to be replaced by domestic sheep dung only) (Evenari et al., unknown) (Ninari et al., 2002) (Fig. 62)

5.3 Makhad Trust water dams in the High Mountains of Sinai Peninsula

According to the declared capacity profile of the for-profit and nonprofit organizations in the High Mountains of Sinai Peninsula (check Ch. 3), Makhad Trust operates several water-based projects, as it is involved in water dams construction, water wells construction and maintenance, in addition to the introduction of sustainable water pumping techniques. In other words, Makhad is into semi-arid watersheds management without any previously declared experience and/or research/study-based approach. Local entrepreneurs provide tradition-based knowledge support in practice, selecting the location of the water constructions. Actually as reviewed in the Negev Highland case-studies, the local tradition-based knowledge is an extremely valuable two millennia trial and error practical experience; an optimum socio-ecological relation balancing between local water needs, environmental capacity and biodiversity. Unfortunately, it is not the case of the High Mountains of Sinai Peninsula, as Makhad trust is not following the ancient traditional watershed management techniques and methods,³⁶ but the trustee started to introduce water storage dams

³⁶ Monastic Byzantine water harvesting techniques and orchards/farmhouses agriculture in the High Mountains of Sinai Peninsula (i.e. to be discussed in the sections below) (Shams, 2010a, 2011e); “Consequently, there is a good tradition of small-scale surface runoff conservation and rainwater harvesting. The yield of this system is important as a source of water to small (often island) settlements and villages and for the Bedouins. Development of this recourse should be maintained using the existing

without any precedent traditional or scientific knowledge about their setting–site and location study–and environmental impact on the mountain range (Makhad, 2012) (Fig. 15b).³⁷

Hence that according to the Quality Function Deployment ‘QFD’ model, the trustee obtained overall all points of 102 for accountability (i.e. *importance weighting* ‘IW’ II), reflecting high efficiency and social trust level, with exception to intermediate mark of 3 points for ‘Conservation (+)’.

St. Catherine Natural Protectorate–Egyptian Environmental Affairs Agency ‘EEAA’, Ministry of State for Environmental Affairs–is the official governmental institution in charge of studying, monitoring and deciding about all human activities within the legal boundaries of the protectorate in theory. It is a powerless underfunded institution, hardly recognized on ground after a potential progress in 1996–2003 CE, and continuously being accused as an obstacle for development by enforcing constraints without providing feasible alternatives for the dynamic local socioeconomic and socio-ecological needs.³⁸

techniques and embedded in rural development programmes that should be implemented with a high degree of stakeholder participation and ownership.” (Ragab et al., SEAM, 2003–2004)

³⁷ Not a single water storage dam was established in the highland patterns–remote high-elevated upland areas, 1550–1600m ASL to mountain summits–of the High Mountains of Sinai Peninsula before the Makhad water dams. St. Catherine Natural Protectorate introduced in 1996–2003 CE a water storage dam at W. Gharba below 1440m ASL (Dahari, 2000) (Shams, 2011e), allowing a complete ecological cycle at the highland patterns: “Location of the ecological system along the precipitation gradient determines the relationship between crust and shrub patches. Reduction in shrub cover leads to an increase in crust cover and vice versa. When resources shed from the crust patches are not sufficient to support the shrub patches, landscape diversity and productivity decrease. Any change in the landscape mosaic, in either direction, promotes desertification processes.” (Zaady et al., Hare ed., 2009) Sand/rock-filled reservoirs/dams are used to decrease the evaporation rates from open water surfaces up to 90% efficiency with 55% storage volume (m³) deduction, in addition to the application of floating foam-rubber cover sheet–5mm thickness–to create a water surface sealant layer of 80–90% efficiency (National Academy of Sciences, 1974).

³⁸ Section 3, chapter 6 covers the monitoring section within the Comparative Corporate Governance Model ‘CCGM’, including the role of St. Catherine Natural Protectorate in practice.

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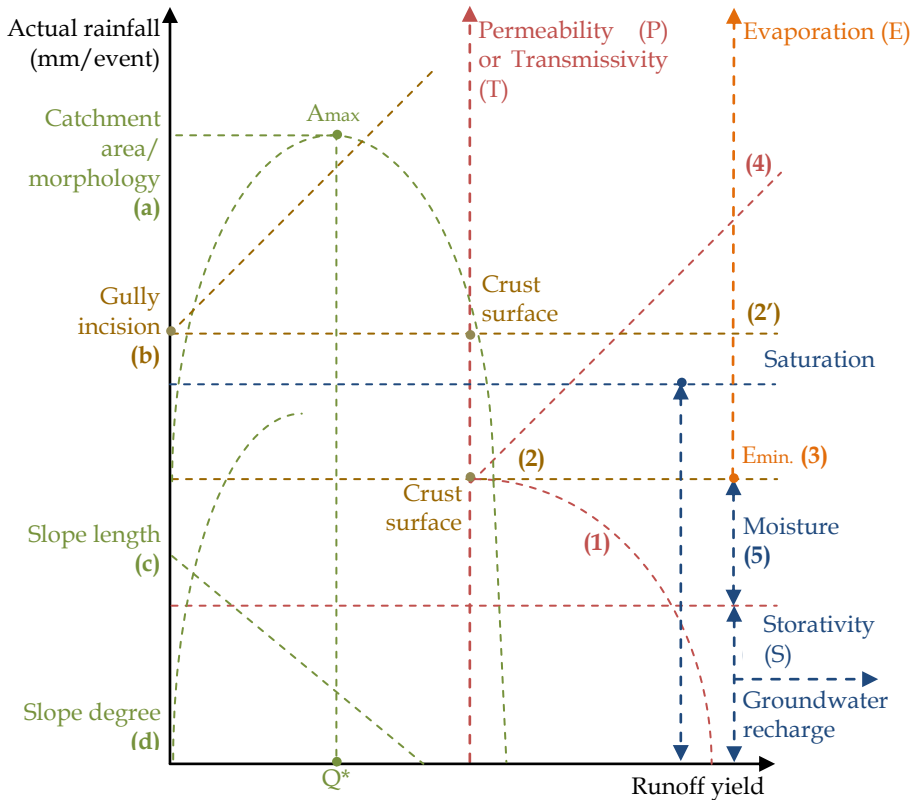


Figure 62 Runoff yield cycle-sequence under rainfall storm events and soil Permeability (P) or Transmissivity (T) 'volume of water (m³)/section (m²)/time(s)': 1) rainfall (mm/h) infiltrates the dry soil, as runoff yield = 0mm, 2) a crust surface-formation-seals the soil, 3) potentially decreasing the evaporation rate-Evap.min.- 'volume(mm)/time(s)/section (m²)'; 4) runoff yield (mm) α rainfall intensity (mm/h) till the end of the event; 5) soil moisture 'field capacity' (%) at the end of rainfall event; 6) groundwater recharge (mm/event) at the end of rainfall event; landform factors: a) catchment area α runoff yield up to Amax. (km²)/Q* (mm); b) gully incision 'high erosion rate' is 1/α loess soil and crust surface formation, decreasing soil moisture 'field capacity' (%); c) slope length (m) 1/α runoff yield (mm); d) slope degree α runoff yield (mm): Sinai Peninsula Research 2010-2013 CE/SinaiAlps Project 2011-2012 CE

In order to emphasize on the environmental aspects of the water storage dams, in addition to their site and location study on natural water resources, biodiversity and desertification, the arid watershed

management at the Negev Highland shed the light on various implications:

In the beginning of our research we wondered why the ancient farmers made the terrace walls only 30cm high and did not try to retain more water on the terraces. We understood the reasons when we found out that the loess soil of the terraces was not more than 3m deep and that 30cm of water are just enough to bring the soil to its full holding capacity. Once the water has infiltrated the soil, the same crust mentioned before is formed on the interface soil-atmosphere. It 'seals' the soil against evaporation and the soil loses not more than 8-10mm of water per growing season by evaporation, and this on an area where about 2.5m of water evaporate annually from an open air surface (Evenari, Berkofsky et al. ed., 1981).

Since water is a fluid, storage means working against gravity and evaporation. Those two factors work against each other; a high ratio of water surface to volume of storage has a positive significance from the point of view of the economics of the storage structure, but negative from the evaporation stand-point....Storage can be increased by transporting the accumulated water to an area where it can recharge the subsurface or by covering it with some material that reduces evaporation such as plates or monolecular layers (Issar, Berkofsky et al. ed., 1981).

5.4 The future Farsh Za'tar experimental orchard: selection criteria

There is no doubt that the previously mentioned implications might differ or imply to the High Mountains of Sinai Peninsula. A further investigation similar to the one of the Avdat farm is required in practice to analyze the impact of the Makhad Trust water storage dams on the natural water resources, biodiversity and desertification. Due to the inexistence of any legislations or regulations on the reuse of archeological sites for similar Avdat research practice³⁹ along with

³⁹ A number of 76 archeological sites—mostly Byzantine monastic settlements—were recorded, surveyed and/or studied by Uzi Dahari 'Hebrew University of Jerusalem', Israel Finkalstein and A. Goren 'Saint Catherine Field School' in 1970s CE, in addition to another 54 ancient sites were recorded by Sinai Peninsula Research 2000-2013 CE during phase I in 2000-2008 CE, scattered on the High Mountains of Sinai Peninsula; all to be used as a source of information about ancient mountainous agriculture system and semi-arid

other causes, concurrently with the search for an optimum location, the following criteria are set to identify a feasible experimental farm among 623 mountainous orchards, resulting three potential sites-locations, as the orchard of Farsh El Za'tar is the selected one (Shams, 2011e) (Tab. 31):

Table 31 Selection criteria for an experimental farm at the High Mountains of Sinai Peninsula

Aspect/Location	Farsh El Za'tar	Ma'ien El Raiyan	W. Abu Seba
Orchard no.	O172	O179	O392
Geology/Soil			
Red Granite 'Alkaline/Alkaline Affinity'	√	≈	√
Topography			
Wadi 'valley' not Naqb 'trough'	√	√	√
NW-SE orientation (min. evaporation Vs max. infiltration/snow precipitation)	√	----	√
Highland pattern (1600m+ ASL)	√ (2000m ASL)	√ (1840m ASL)	√ (1600m+ ASL)
Single farmstead/watershed and/or upstream area	√	none	none
Single farmstead/Gidda 'dike'	√	√	√
Water availability			
Sizable watershed	√	√	√

watershed management, and to be excluded due to the inexistence of any reuse legislations or regulations (Shams, 2011e).

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Groundwater	----	√	≈
Isolated-independent water table	√	≈	≈
Ownership			
Traditional land use right	√	√	√
Natural resources right	√	≈	√
Archeological zones clearance			
Out of buffer zones	√	----	√
Equipment/instruments safety			
No off-road accessibility	√	√	≈
Logistics			
Accessibility	√ (camels)	√ (camels)	√ (vehicles)
Market			
Medicinal plants/fruit production	√	≈	≈

5.4.1 Farsh El Za'tar experimental orchard environmental setting

The geological setting of the High Mountains of Sinai Peninsula (i.e. Sinaitic Plate) is described as follows (Shams, 2011e):

The mountains of South Sinai are composed of metamorphic and igneous rocks which are part of Arab-Nubian massif. The metamorphic rocks, especially gnesis and schist, represent the earliest composition of Sinai mountains. These rocks were formed mainly from earlier igneous rocks, which have not been preserved. Several waves of volcanic rocks penetrated into the metamorphic composition, which dated earlier than Precambrian (Crystalline) (Dahari, 2000) (Mills et. al., 1989).

The high mountains are mostly magmatic in origin and are composed of plutonic and volcanic rock. Most of these rocks date to Precambrian Era (500-1,000 million years ago) (Perevolotsky, 1981).

According to Perevolotsky and Dahari, those volcanic waves resulted different types of rocks which could be classified according to origin and age as follows: ancient volcanic rocks (Tuff...etc.: Gebel Katharina Plateau base), primary plutonic rocks (Diorites and Syenites: Gebel Muneiga), young volcanic rocks (rhyolite and ignembrit–black rocks–Gebel Musa, Gebel Anshil, Katharina Plateau and its peaks) and young plutonic rocks (red granite–red rocks–high mountain region) (Perevolotsky, 1981) (Dahari, 2000) (Shams, 2011e) (Fig. 63) (Tab. 32).

Farsh El Za'tar falls in the arid North African belt, characterized by a Saharan-Mediterranean climate (UNDP, 2002) (Grainger, 2003) (Zalat et al., 2008) (Tab. 33).

5.4.2 The aspects of Sinaitic mountainous agriculture

Based on the archeological surveys of Dahari, Finkalstein and Goren in 1970s CE for the Byzantine monastic settlements, orchards and farmhouses,⁴⁰ the following are the elements of the widely spread ancient agriculture system in the High Mountains of Sinai Peninsula:

- 1 a plot of land on one of the banks of a dry wadi 'valley', inside a naqb 'trough' or a small mountain basin, mostly at the Red Granite areas, surrounded by a retaining wall of an average dimension 1m high and 1m wide⁴¹
- 2 mature soil of high clay content is imported from the black rock areas–flashfloods erosion protection by the walls–in order to fertile

⁴⁰ At South Sinai in 4th-7th centuries CE, a number of 530-600 monks lived in the monastic settlements during the peak of the monastic activity. The sites of the monastic settlements were chosen in locations which provide a good view for the surrounding summits which were used as natural clocks via their relation with the intensity of light. The rural economy of the monks was based on orchards and farmhouses agriculture system–attached to some a winepress–surrounded by church buildings and hermit cells; in addition to one, two or three(+) room(s) per complex(es) and/or dwelling(s). There were no sleeping benches found in the hermit cells or dwelling rooms. The cells and dwelling rooms were erected under boulders, adjacent to cliffs or built as square house; generally, they preserved no eye contact between each other (Finkalstein et al., 1985) (Dahari, 2000) (Shams, 2010a, 2010b, 2011c, 2011e).

⁴¹ The retaining walls' bottom part is plastered in order to preserve the water.

the existing red rock arcose soil and increase its water holding capacity/rainfall-irrigation

- 3 ground-leveled terraces are established for balanced irrigation
- 4 pits are dug around the trees for controlled irrigation
- 5 a water well supplies the orchard or farmhouse with an adequate daily volume of water
- 6 the water is pumped manually from the water well to a plastered reservoir upslope for storage, then irrigation, or directly to the tree pits for irrigation
- 7 runoff water due to rainfall or snow precipitation is collected by plastered conduits—up to 850m—along the impervious flat Red Granite slopes and transferred to the reservoir(s) or cistern(s) as an alternative source⁴²
- 8 stone water dams—equivalent to Negev Highland terraces—are built in the mainstream above the orchards, as the floodwater flows from one terrace to the next,⁴³ trapping soil⁴⁴ and water behind each, and raising the groundwater and moisture level in the soil (i.e. subsurface water), while allowing mountainous agriculture (Finkelstein et al., 1985) (Dahari, 2000) (Shams, 2010a, 2010b, 2011c, 2011e) (Fig. 15a).

The gravelly nature of the arcose soil is characterized by the absence of deep clay content, lower moisture level ‘holding capacity’ and higher groundwater outflow compared to the loess soil formations. As a result, the agriculture system is mostly based on groundwater and

⁴² Springs (i.e. 30 springs) are not common reliable alternative source in the High Mountains of Sinai Peninsula due to their low yield (Perevolotsky, 1981) (Dahari, 2000) (Shams, 2010a, 2010b, 2011c, 2011e).

⁴³ In January-February 2010 CE, Sinai witnessed the first flash floods in 10-15 years, followed by other discontinuous seasonal events in late/early 2011/2012 and September-November 2012–2012/2013 respectively (Shams, 2011e) (El Shrouk Newspaper, September 29, October 1-3, November 3, 2012, January 7/29, 2013).

⁴⁴ Gravel/sand, while silt/soil spills over the terrace wall (National Academy of Sciences, 1974).

reservoir-based irrigation (Tab. 34),⁴⁵ not runoff one similar to the Avdat case-study:

Aquifers in consolidated and unconsolidated rocks are higher on the storage capacity scale, as due to their large volume they may be useful for long-term storage....Aquifers should be viewed from two aspects: (1) renewable storage (Farsh El Za'tar–Red Granite–case-study), and (2) one-time storage or stock reserve. When dealing with the renewable storage capacity of certain aquifers, the first constraints to be taken into consideration is environmental, namely the irreversible negative changes which can affect the aquifer due to the pumpage beyond the “safe yield”.⁴⁶ The second constraints are socio-economical mainly guarantee the supply on a long-term basis. This calls for a system approach for planning the use of storage over time, the objective of which is optimal deployment of renewable storage (either naturally or artificially included) during drought periods of high probability (Issar, Berkofsky et al. ed., 1981).

Accordingly, the agricultural products—mainly fruit trees—till nowadays are Apricot ‘sum of two varieties’ (first half of June), Apple ‘sum of five varieties’ (end of June), Peach and Fig (beginning of July), early Grapes (mid July), Fig, Plums ‘sum of three varieties’ and Grapes ‘sum of three varieties’ (end of July - beginning of August), Almonds ‘sum of two varieties’, Pomegranates and Apples ‘sum of five varieties’ (August), Pear ‘sum of 6 varieties’ (end of August), Quince (September), Red Grapes and winter Apples ‘sum of five varieties’ (October), and winter Pear (end of October and beginning of November). In 1970s CE, 50% of the orchards grew seasonal vegetables and other crops such as Tomatoes, Tobacco, Pumpkin, Mulukhaih, Riji-

⁴⁵ The relative economic infeasibility and/or unsuitability of trickle/subsurface, sub-irrigation, gated pipes, sprayers, spitters/bubblers and perforated pipes irrigation systems for limited household-based mountainous agriculture would be compensated with the excess availability of labour force—reducing unemployment—and/or low cost simple techniques on scientific basis (e.g. pitcher irrigation for medicinal plants); underground moisture barrier (e.g. continuous films of water resistant material) is used to prevent water percolation (Sinai Encyclopaedia, 1960) (National Academy of Sciences, 1974).

⁴⁶ Step/Constant Discharge Tests are used to determine the safe yield ‘permissible discharge’ m³/day (Ibrahim et al., 1989); it is a matter of hydrologic feasibility (i.e. supply-demand) in terms of quantity, quality and timing (Allam, 1998).

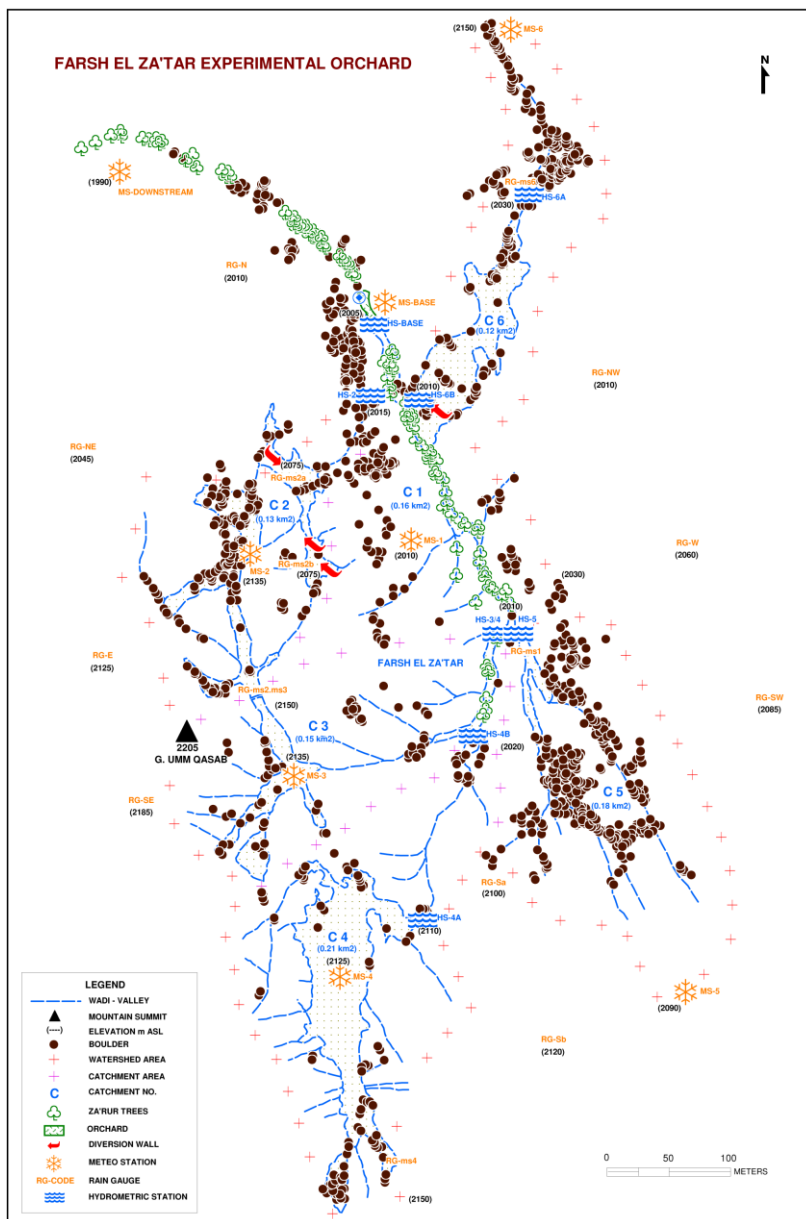


Figure 63 Farsh El Za'tar watershed and experimental orchard in the High Mountains of Sinai Peninsula: Sinai Peninsula Research 2010-2013 CE/SinaiAlps Project 2011-2012 CE

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Table 32 Farsh El Za'tar landscape structure factsheet

Aspect	Description/Value
Lithology	<p><i>Vicinity:</i> Two main rock formations: the highly eroded, worn and cracked black rocks, and the red rocks with small rock slide 75-85%</p> <p><u>Cenozoic Era : Tertiary Period : Miocene Epoch (23-5.3 million years ago)</u> - Olivine-basalt and dolerite (dikes, sills and flows) <u>Precambrian Era (4,600-540 million years ago)</u> - Granite, alkaline or alkaline affinity - Syenite and monzonite in ring dike complex - Acid alkaline volcanics, non-deformed (Katharina volcanics) - Calc-alkaline granitoid rocks - Quartz-diorite and gabbro - Weak metamorphosed or tectonized metavolcanic and metasedimentary rocks (feirani group) - Metamorphosed, often primary layered, basic and ultrabasic rocks</p> <p><i>Orchard:</i> Red Granite, flat impervious surfaces (i.e. alkaline/alkaline affinity) (Survey of Israel, 1970s) (Survey of Israel, 1997) (Dahari, 2000)</p>
Morphology	<p>Northwest → Southeast topographical orientation/wadis 'valleys' (El-Sorady et al., 1992) (Shams, 2011e)</p>
Chemical composition of stones	<p>Quartz, biotite, muscovite and feldspars (Dahari, 2000)</p>
Soil	<p>- Black rocks: mature soil with high clay content; red rocks: immature–crumbled gravel with small amounts of clay–arcosic soil (Perevolotsky, 1981) - Erosion rate: ---- - Mechanical analysis–range–of the vicinity 'northern half' based of 15 sites pilot-survey: stony, weed of cultivation, calcareous, granite, cultivated waste ground, wadi bed and terraces, rocky, mist ground, sheltered cliffs, marshy places, sandy, stony and sandy, stony wadis, stony granite, sandy and rocky, sandy and alluvial, sandy and gravelly, and sandy, stony and calcareous (Mosallam, 2007)</p>

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Mean	Gravel	Sand	Silt	Clay
Max.	64.7	63.9	2.8	24.4
Min.	30.8	28.7	0.4	5.1
Mean	PH			
Max.	8.3			
Min.	7.2			

EC – Anion and Cations (Meq/L):

Mean	mmh cm ⁻¹	O.C. %	CaCO 3	Cl ⁻	Na+
Max.	1.8	1.8	13	5.2	2.6
Min.	0.2	0.5	0.4	1.4	0.7
Mean	Mg++	Ca++	K+		
Max.	7	8	8.5		
Min.	2.3	3.8	0.4		

- Farm: ----

- Soil hydrologic group 'vicinity': D, characterized by very low infiltration < 1.27mm/hr (i.e. groundwater potentiality \propto runoff yield);⁴⁷ prolific groundwater potentiality along the mainstreams (Elewa et al., 2011); infiltration of the Red Granite dominating formation = 4.074 mm/day/m² (Ali, 2001)⁴⁸

⁴⁷ Geoelectrical survey(s) would be conducted to delineate the extension of the water bearing formations in terms of lithology, thickness (m), depth (m), range (km²) and yield estimate (m³) (i.e. fluctuations considerations); the water reserve volume (m³) and quality–seasonal variation and pollution 'upward leakage' considerations–would be verified by the existing and future drilled wells, in addition to the impact of the geological structure (e.g. faults) on potential recharge rates (i.e. Isotope Surveys; e.g. source and direction of recharge), while considering the impact of water tapping/pumping (Youssef et al., 2004).

⁴⁸ Modelling requirement: Infiltration Test.

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Table 33 Farsh El Za'tar climate-vegetation factsheet

Aspect	Description/Value							
Elevation	2000m ASL							
Koppen's climate classification	----; mean max. and min. temperatures: 36°C 'August' and -7.8°C 'February'(Grainger, 2003); other sources: average max. 'July-August': 24-34°C and average min. 'January-February': -4 to -14°C; overall temp./month in 2008 CE (Zalat et al., 2008):							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
	9.5	13.2	18.6	22.9	24.6	24.9	23.5	21.1
	Sep	Oct	Nov	Dec				
	17	11.9	8.6	7.7				
Mean annual rainfall	Average min. and max. temperatures respectively (Sinai Encyclopedia, 1960): ⁴⁹							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
	3.1	4.2	2	4.3	6.5	10.5	11.2	11.6
	4.8	4.4	11.8	14.4	17.1	20.8	21.4	22.2
	Sep	Oct	Nov	Dec				
	11.4	7.8	3.1	3.3				
	21	16.2	11.4	4.4				
	Very low sporadic rainfall; mean annual 43.6-60 mm/year 'rain season: October-May' (i.e. rainfall/storm events occur in winter season 'December-February', ⁵⁰ as the average no. of rainfall days 10.1/year with a max. rainfall 76.2mm/day (Dames & Moore, 1979-1985) (El-Sorady et al., 1992); irregular/spottiness 'due to slope orientation and wind direction'; average trend of 7 years cyclic drought periods) ⁵¹ (UNDP, 2002) (Grainger, 2003); actual total rainfall 32.8mm/year (Zalat et al., 2008):							

⁴⁹ In 1898 CE, Thomas Barron recorded -9°C at an elevation of 1520m ASL at the junction of El Raha Plain, W. El Dier and W. El Sheikh (Barron, 1907).

⁵⁰ In August 2008 CE, a flashflood-rare summer rainfall-occurred at W. Quweiz and W. Tilah 'Rudhwah' at an elevation of 1550-1350m ASL (Shams, 2011e).

⁵¹ In 1866-1909 CE, an average trend of cyclic drought periods was 3-4 years instead of 7+ years; 1989 CE was the end of 7 years drought period (Hobbs, 1995); last drought period occurred in late 1990s-early 2009 CE for 10-15 years

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Jan 5	Feb 2	Mar 6.3	Apr 3.9	May 2.1	Jun 0	Jul 0	Aug 0
Sep 0	Oct 1.9	Nov 6.3	Dec 5.3				
Average rainfall mm/month for an actual total 63.2mm/year (Ali, 2001):							
Jan 1.7	Feb 1.6	Mar 13.4	Apr 7.9	May 6.4	Jun 0	Jul 0	Aug 0
Sep 0	Oct 3.8	Nov 21.5	Dec 6.9				
Actual total mm/year–1980s CE: average 24,34mm/year–and average mm/month rainfall for the Northern Half of the High Mountains of Sinai Peninsula in 1980s CE respectively (El-Sorady et al., 1992):							
80 38.4	81 14	82 47.5	83 20.6	84 4.8	85 6.2	86 18.5	87 23.3
88 40	89 30.1						
Jan 3.48	Feb 2.47	Mar 4.73	Apr 3.79	May 1.31	Jun 0	Jul 0	Aug 0.17
Sep 0	Oct 0.47	Nov 2.96	Dec 4.96				
Actual total rainfall mm/year–1970s CE: average 65.65 mm/year–for the Northern Half of the High Mountains of Sinai Peninsula in 1969/70-1980/81 CE (Issar et al., 1982):							
70 47	71 24	72 19	73 61	74 96	75 125	76 59.4	77 75.7
78 83.7							
Average rainfall mm/month–1960s CE: 61.9mm/year–and max. rainfall mm/day in 1961-1967 CE respectively (El-Shrbieny, 1991):							
Jan 1.5	Feb 1.4	Mar 13.2	Apr 8.8	May 6.2	Jun ----	Jul 0	Aug 0

(Shams, 2011e); in 1998-2007 CE, flashfloods occurred in Sinai Peninsula every 3-4 years (Milewski et al., 2009)

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		3 Sep 0 0	1.5 Oct 3.6 6.01	31.4 Nov 21.4 76.2	28.3 Dec 6.8 8	11.5	----	0	----
		The ratio of seasonal rainfall–winter, spring, summer and autumn–to the actual total/year is 15.8-16%, 28.8-43.9%, 0% and 39.2-40.4% respectively (El-Shrbienny, 1991) (Sherief, 2008)							
Annual dewfall		---- ‘no record’							
Evaporation		Potential evaporation rates (mm/year/open water surface) are very high-in excess of 20 mm/day during August (Grainger, 2003); evaporation rate–average 11.2 mm/day–and actual total evaporation–average 339 mm/month–respectively for an actual total evaporation 4071mm/year (Ali, 2001):							
		Jan 6 186 Sep 11.7 351	Feb 7.3 205 Oct 10.5 325	Mar 9.3 388 Nov 7.2 216	Apr 12.6 378 Dec 6.1 189	May 15.2 471	Jun 17.8 534	Jul 16.2 502	Aug 13.7 434
Precipitation- Evapotranspiration index		---- ‘no record’; orographic snow precipitation: 300 mm/year (Grainger, 2003) ⁵²							
Solar radiation		---- ‘no record’; solar intensity/sunny microhabitats: 1,390-9,480 Lux and solar intensity/shady microhabitats 109,000-128,000 Lux at noon (UNDP, 2002)							
Dryness index		---- ‘no record’							
Relative humidity ‘R.H.’		Average 32.2%/year, rarely exceeding 50%; average %/month (Grainger, 2003) (Zalat et al., 2008):							
		Jan 43 Sep 27	Feb 45 Oct 31	Mar 34 Nov 38	Apr 26 Dec 40	May 31	Jun 28	Jul 27	Aug 28
		Average 30%/year in 1981-1988 CE; average %/month							

⁵² One day snowfall occurred on March 1, 2009 was the first snowfall event since 2002 CE, followed by other discontinuous events in December-January 2012-2013 CE (Shams, 2011e) (El Shrouk Newspaper, January 7/29, 2013).

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	(El-Shrbieny, 1991):							
	Jan 43 Sep 27	Feb 30 Oct 31	Mar 32 Nov 33	Apr 23 Dec 40	May 20	Jun 25	Jul 24	Aug 27
Thornthwaite moisture index	---- 'no record'							
Ground temp.	Below freezing point/unidentified no. of nights/year; soil temperatures/sunny microhabitats: 12.6-41.6°C and soil temperatures/shady microhabitats: 1.5-18°C (UNDP, 2002)							
Vegetation	Soil + climate: phytogeographic regions: Saharo- Arabian-desert vegetation-(i.e. lands below 1300m ASL) and Irano-Turanian-steppe vegetation-(i.e. lands above 1600 meters ASL) (Grainger, 2003); sparse and lack of trees with exception to Zaa'rur tress, in addition to lichens and algae							
Wind speed	km/hr (El-Shrbieny, 1991)							
		Jan	Feb	Mar	Apr	May	Jun	Jul
	N	4.3	4.8	16	2.9	3.1	5	2
	NE	7.5	2.4	89	10.9	85	10	5.6
	NW	12.9	14.4	13.1	12.5	7.7	13.8	1.3
	W	27.4	33.5	25	23	15	21.3	39
	SW	32.3	36.5	27.4	31	43.3	19.3	35.4
	none	7.5	3.6	64	11.7	85	19.7	19.8
		Aug	Sep	Oct	Nov	Dec		
	N	16	3.1	0.9	1.7	4.8		
	NE	4.8	25	73	2.9	65		
	NW	32	2.1	2.8	8.8	4.5		
	W	20.3	34.5	27.8	16.3	13.8		
	SW	32.7	29.2	39.5	35.1	41		
	none	14.6	18.7	6.9	17.2	18.3		

ah, Watermelon, Onion, Eggplant, Fava Bean, String Bean Cantaloupe, Red Pepper, Mallow, Basil, Purslane, Spearmint, Rosemary, Prunes, Quince, Zucchini, Sorghum, Guava, Carob, Orange, Lemon, Olive, Date, Wheat, Corn and Walnut; in addition to Avocado, Aubergine, Jujube, Courgette, Mulberry, Alfalfa, Okra, Lettuce, Parsley, Pea, Pepper, Cress, Rocket and Spinach (Perevolotsky, 1981) (Hobbs, 1995) (Zalat et al. 2008) (Shams, 2010a, 2011e).

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Table 34 Physical, chemical and isotope data for groundwater: red granite rock area-sample (Tantawi et al., 1998)⁵³

Sample No.	Sample Location	Rock Type	PH	EC	TDS
4	Town of Katharina	Red Granite	7.09	397	254
Cations (mg/l)		Cations (mg/l)		Anions (mg/l)	
Na ⁺	K ⁺	Ca ²⁺	Mg ²⁺	Cl ⁻	HCO ³
38	3	16	28	39	181
Anions (mg/l)					
SO ₄ ²⁻	NO ₃ ⁻	SAR	δ ¹⁸ O	δD	(d)
34	2	1.33	-4.99	-24.3	15.63

⁵³ Red Granite is impermissible, providing shallow groundwater level, easily reached by digging water well at an average depth of 4-5m in the arcotic soil of the dry highland pattern streams (Dahari, 2000); average yield/41 water wells/town of Katharina = 90m³, 3-40m deep and salinity 250-750 PPM (SEAM, 2003-2004) (i.e. Central-South Sinai profile: crystalline basement rocks water-bearing, 16-45m deep 'meter below ground level-mbgl') (Elewa et al., 2011).

5.4.3 Modeling the watershed of the future Farsh El Za'tar experimental orchard⁵⁴

The most accurate estimates for surface runoff can thus be achieved through direct measurements (Helwa, 1995).

Due to the bounded rationality reflected in time, financial resources, terrain remoteness...etc. at the Negev Desert and Sinai Peninsula, the Representative Catchments Approach is used to collect meteorological and hydrometric data about different geological, lithological, morphological, geographical...etc. settings. Avdat and Nahal Yael are long-term record-keeping examples—40+ years—of such representative catchments in the Negev Desert (i.e. dense networks of gauges and metric stations) (Evenari et al., 1971) (Evenari et al., unknown) (Evenari, Berkofsky et al. ed., 1981) (Bahat et al., 2009) (Zaady et al., Hare ed., 2009). In 1989-2003, the Egyptian Research Institute for Water Resources 'RIWR' in collaboration with Bureau de Recherches Géologiques et Minières 'BRGM'—post phase I: Sinai Water Resources Study 'SWRS', commenced in 1980 CE—established a short-term runoff record-keeping project in Sinai Peninsula at W. El Qusaima 'Qadeirat' (East-northeast), W. Sudr (West-southwest) and W. El Sheikh 'town of

⁵⁴The remote sensing method-based hydrological models for Sinai Peninsula focus on the groundwater potentials (i.e. sustainable development core driver), mainly based on eight layers of datasets: i) rainfall 'meteorological data'; ii) net groundwater recharge; iii) lithology or infiltration; iv) lineament density; v) slope; vi) drainage density; vii) depth of groundwater; viii) water quality—with importance weighting from i to viii of 0.3, 0.2, 0.2, 0.1, 0.05, 0.05, 0.05 and 0.05 respectively—ix) water sources data (i.e. an average of 386 water points/Sinai Peninsula); in addition to geologic units, geomorphologic features, catchment size, land cover, vegetation and hydrochemical, all to be justified by boreholes and drilling data Vs Avdat and Nahal Yael field experience (i.e. field-model 'Avdat/Yael', not model-field approach). Other methodologies involve meteorological (e.g. rain gauges networks), isotopic techniques and runoff studies (e.g. hydrometric stations) (Milewski et al., 2009) (Elewa et al., 2011); watersheds of areas less than 2000km² are omitted from the selection—model limitations—Vs Avdat/Yael small and micro-catchments practice (Milewski et al., 2009); groundwater potentiality/Sinai Peninsula = 300 million m³/year, as 90-100 million m³/year are in use (SEAM 2003-2004).

Katharina' (Central-south) as representative catchments. Only the records of W. Sudr are the reliable ones (Helwa, 1995)!⁵⁵

On the administrative level, the Institute of Hydrology of BRGM highlighted the following obstacles:

- 1 lack of hydrological staff
- 2 loss of staff once trained
- 3 limited attention to the project resources and administration
- 4 lack of monitoring system or network
- 5 limited organizational collaboration and data circulation
- 6 long-term recordkeeping costs
- 7 Cairo-based centralization

The impact of such obstacles on the representative catchments project is concluded in Helwa 1995. High priority development areas-settlements-are identified throughout Sinai Peninsula for runoff and groundwater research, and data acquisition, excluding the High Mountains of Sinai Peninsula.⁵⁶ (BRGM, 1988) Actually, a watershed management model must regard two levels of interval-based actions:

- 1 short-term: livelihood and social welfare (i.e. social services and/or temporary reversible solutions (e.g. unreinforced terraces) during the modeling/planning phase)

⁵⁵ There are three main categories of valley-systems in Sinai Peninsula: i) Gulf of Suez, Western Drainage System of 18 million m³/year mean runoff yield; ii) Gulf of Aqaba, Eastern Drainage System of 36 million m³/year mean runoff yield; iii) Central Drainage System of 9 million m³/year mean runoff yield (Helwa, 1995).

⁵⁶ Phase II data records: i) El-Arish-Rafah 'Northeast Sinai'; ii) W. Girafi 'East Sinai'; iii) Qa'a Plain (BRGM, 1988), where the groundwater mean max. yield in Sinai Peninsula occur at El-Arish and Qa'a Quaternary deposits (i.e. 200m³/day), with average yields 18 and 28liters/s respectively, while the Lower Cretaceous '+older' large scale folds and faults allow the max. recharge rates (Butrus, Sinai Encyclopedia, 1960) (Mills et al., 1989).

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- 2 long-term: sustainable permanent services and/or water management/irrigation constructions (i.e. water dams and wells, cisterns, conduits...etc.) (Warren, 1998).⁵⁷

In modeling practice, two main rules govern the future experimental orchard of the High Mountains of Sinai Peninsula:

- 1 the nano size of Farsh El Za'tar watershed/drainage basin–95 hectares/6 catchments–reflects the aimed household/orchard-based level behind the model (i.e. semi-arid watershed management), supplying higher runoff yield than the vast ones
- 2 a dense network of 8 meteorological stations, 15 rain gauges, and 8 hydrometric stations cover all the 6 catchments and their buffer zone in order to overcome all the specificities of arid and semi-arid watersheds–climate setting–considering the interrelation between catchment area, orientation, slope, land cover and soil on one hand, and precipitation, runoff yield, groundwater recharge on the other hand (Tab. 35) (Fig. 63)

Table 35 Farsh El Za'tar experimental orchard factsheet

Aspect	Value
Drainage basin 'watershed'/Catchments	
6 catchments/watershed	Total area: 95 hectares (950,000m ²)
Watershed length (range)	835-1,300m
Watershed width (range)	860-1,550m
Catchment No.	Areas (hectares)
I	0.16
II	0.13
III	0.15
IV	0.21
V	0.18
VI	0.12

⁵⁷ Several factors contribute to the underdeveloped status of the upland and mountain regions: "i) fragility of upland ecosystem; ii) population growth; iii) a shortage of arable land and low agricultural yields; iv) disadvantaged market conditions; v) limited job opportunities; vi) a lack of infrastructure and services; vii) a lack of political influence–decentralisation solution–viii) top-down conservation policies." (Warren, 1998)

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Agricultural area

- Total: undetermined
- Experimentally used: 0.08 hectares/1 terrace

Ratio 'R' = area of catchment basin/area of cultivated field

Block no. 1 only

1188:1 = Farsh El Za'tar basin
95:0.08 agricultural plot 'OI72'

Meteorological stations 'MS' = 8

	Downstream 'DS'	Base 'B'	MS- 1	MS- 2	MS- 3	MS- 4	MS- 5	MS- 6
Elevation (m)	1990	2005	2010	2135	2135	2125	2090	2150

Rain gauges 'RG' = 15

	N	NE	E	SE	Sa	Sb	SW	W	NW
Elevation (m)	2010	2045	2125	2185	2100	2120	2085	2060	2010
	ms 1	ms 2a	ms 2b	ms 2-3	ms 4	ms 6			
Elevation (m)	2010	2075	2075	2150	2150	2030			

Hydrometric stations 'HS' (flood gauges) = 8

	Base	2	3a	3b	3/4	5	6a	6b
Elevation (m)	2005	2015	2110	2020	2010	2010	2030	2010
	Slope range				1°-90°			

5.5 Preliminary conclusion: the environmental impact of Makhad Trust water storage dams

There is no doubt that each newly constructed water dams is a self-standing case-study which requires site/location pre-study (i.e. interdependent watersheds management plan); unfortunately, no scientifically-based environmental impact assessment was conducted prior the construction of any of the already existing ten water dams. In this regard, the following are the environmental key aspects of three

Makhad Trust water dams of different settings in the light of the local-regional environmental setting (Tab. 36).⁵⁸

According to the previous preliminary comparative assessment, the site/location in terms of orientation and soil depth, in addition to the structure design in terms of height and spillways-dropdown structures, those factors have an absolute impact on the available scarce water resources in terms of solar exposure/evaporation rate, sediments accumulation/infiltration rate, reservoir capacity in front of the water dams upstream, salinity, vegetation density behind the water dams downstream, valley system accessibility and local community-based cooperation. Those factors are considered critical variables to be calibrated under a low cost watershed management model via two main terms:

- 1 community needs/advice-based solution(s)
- 2 the un-eliminated negative aspects due to site/location, structure design and/or community needs must be compensated or deducted by the watershed management model (e.g. prioritization of water resources consumption, concurrently with the floodwater redirection and/or pumping to alternative water storage facilities 'cisterns and semi-exposed reservoirs)

Due to the lack of any precedent traditional or scientific knowledge about mountainous water dams, and the absence of any local-regional Environmental Impact Assessments 'EIA', in addition to the introduction of alien water storage dams to the High Mountains of Sinai Peninsula, and the ignorance of the ecologically efficient tradition-based knowledge (e.g. 'Agoum), the representative sample (30%) of Makhad Trust water dams indicates fatal site/location and design pitfalls, resulting the following:

- 1 high losses in water resources due to long-term solar exposure/evaporation

⁵⁸ Partially, there is no available reliable geo-based information published about the sites and numbers of the previously and/or newly constructed water dams (i.e. an approximate no. of ten water dams were constructed until December 2011 CE, as two additional water dams are planned for 2012 CE) (Makhad, 2012). The three selected Makhad Trust water dams are among seven other accurately geo-referenced ones (Shams, 2011e).



Figure 64 Meteorological station of the European Research Academy 'EURAC', Institute for Alpine Environment 'AlpEnv' at Val di Mazia/Matscher upstream area 'Rio Saldura' 2250m ASL, Bei der Klamm [Garten; Fernerpleisen; Matscher Joch 3185m ASL] (Val Venosta/Vinschgau, 'Alto Adige/Südtirol' province) - November 10, 2011: SinaiAlps Project 2011-2012 CE

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Table 36 A preliminary Environmental Impact Assessment 'EIA' of household(s)/orchard(s)-based mountainous water dams: key aspects factsheet⁵⁹

Aspect	W. Quweiz, W. Tilah 'Rudhwah' and W. El Tala'a El Saghera	W. Zuweitin northeast upslope	W. Shagg and W. El Mathar 'Umm Khuraf' junction
Geology/Lithology/Soil			
Red Granite 'Alkaline/ Alkali -ne Affinity'	√	√	√
Topography 'site/location'			
Elevation (m ASL)	1570	1930	1860
Location	Wadi (valley mainstream)	Farsh (mountain basin)	Wadi (valley mainstream)
Orientation 'α solar/ wind exposure = evaporation rate'	NW-SE wadi (between SW-NE valley walls of 1660-1645m ASL respectively, 300m apart)	SW mountain slope with open SE-NW span	N-S wadi (between E-W valley walls of complex slope profile)
Solar exposure ⁶⁰ (hr./summer - hr./winter) 'α evaporation/ open water surfaces 4071mm/year'	x (Unavailable: medium-high+ = 8.4-11.2hr)	x (Unavailable: high = 11.2- 14hr.) 'solar intensity/sunny	x (Unavailable: medium-high+ = 8.4-11.2hr)

⁵⁹ All the qualitative aspects-(√): positive and (x): negative—are to be quantified under Farsh El Za'tar experiential orchard project as part of the micro watershed management assessment/plan for the High Mountains of Sinai Peninsula.

⁶⁰ Calculated on 14hr. summer day basis (i.e. highest evaporation rates: longest solar exposition and highest temperatures per year): low = 0-2.8hr.; low-medium = 2.8-5.6hr.; medium = 5.6-8.4hr.; medium-high = 8.4-11.2hr.; high = 11.2-14hr.

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		locations: 1,390-9,480 Lux'	
Foundation/Structure Design			
Foundation 'α strength'	√ (Bedrock)	√ (Bedrock)	√ (Bedrock)
Type of water dam ⁶¹ 'α strength'	√ (Rock with mortar Reinforcement)	√ (Rock with mortar Reinforcement)	√ (Rock with mortar Reinforcement)
Height (m) 'α soil moisture/depth'	x Unavailable (swallow flat impervious surfaces)	x Unavailable (swallow flat impervious surfaces)	≈ Unavailable (average depth of arcotic soil 4-5m)
Spillway-dropdown structure 'α anti sedimentation and infiltration'	x (High sedimentation rate 'silt')	x (High sedimentation rate 'silt')	x (High sedimentation rate 'silt')
Reservoir capacity (m³) 'α depth of arcotic soil and 1/α sedimentation/flood' (Fig. 65)	x Unavailable (swallow flat impervious surfaces)	x Unavailable (swallow flat impervious surfaces)	≈ Unavailable
Infiltration ⁶² 'Red Granite: 4.074 mm/day/m²'	x	x	x
Water salinity (PPM)	x (Unavailable:	x (Unavailable:	≈ (Unavailable:

⁶¹ Makhad Trust professionally investigated the strength of the water dams only (i.e. structures strength assessment), resulting an unjustified excess/over investment in building material (i.e. mortar) (Makhad, 2012).

⁶² "It is also noticed that the infiltration losses of the water reservoir at a specific level decreases from one flood to another due to the lining of the valley bed and sides with the silt brought by the consecutive floods." (Butrus, Sinai Encyclopedia, 1960)

Arid and semi-arid watershed management

	higher rate/storage- day)	higher rate/storage- day)	lower rate/storage day due to the relative depth of the arcotic soil)
Vegetation⁶³			
Density/ biomass impact behind the dam downstream 'α spillways- dropdown structures'	x	x	x
Ownership⁶⁴			
Traditional water use right	√ Local community- based cooperation	x Single household/ individual '1/α community- based solutions'	√ Local community- based cooperation
Archeological zones clearance			
Outside buffer zones	≈ (Survey: site no. 33 by Uzi Dahari under the Israeli Antiquities Authority in 1970s CE Egyptian	√	√

⁶³ A pilot vegetation density survey must be conducted prior and post-continuous monitoring/impact assessment—the construction of any water dam.

⁶⁴ Political ecology: "Field experience has led the project to address watersheds more as geopolitical territories (defined on the basis of their governance and social dimensions) than as hydrological units (as in conventional watershed management initiatives)." (Warren, 1998)

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	Supreme Council of Antiquities: unregistered byzantine monastic site		
Logistics			
Valley accessibility obstacle	√	√	√



(2010)

Figure 65 The Makhad Trust water dam at W. Quweiz, W. Tilah ‘Rudhwah’ and W. El Tala’a El Saghera nearby Orchards ‘O70/O72 - Tur Sina Map’ 1570m ASL in August 2010 CE; the lack of spillway-dropdown structure(s) caused high sedimentation rate ‘silt’, resulting low infiltration rate and high evaporation rate, in addition to the decline in the reservoir capacity per each new flood(s): Sinai Peninsula Research 2000-2010 CE

- 2 high sedimentation rates due to the lack of spillways-dropdown structures and the unjustified height of water dams, subjecting the reservoirs to less infiltration rates and capacities till elimination per flashflood⁶⁵

⁶⁵ Historically at the Negev Desert: “the accumulation of the sediment in the canals and fields reduced the amount of water available for irrigation, and the

- 3 sparse vegetation density losses due to the unbalanced water provision behind the water dams downstream as a result of the lacking spillways-dropdown structures and the unjustified height of water dams
- 4 aesthetics problems in St. Catherine Natural Protectorate (i.e. UNESCO World Heritage Site 'WHS' no. 954) due to high sedimentation rates, marked by lack of disposal sites and labor force costs upon any attempts to remove the sediments in front of the water dams upstream and/or the introduction of a mistaken solution by increasing the height of the water dams to overcome the losses in the capacities of the reservoirs, in addition to the unjustified excess use of mortar
- 5 creation of a social conflict-resistance to change/reversible actions-due to the recent introduction of unsustainable and unplanned water use right; it is an obstacle towards the implementation of any watershed management model in the High Mountains of Sinai Peninsula⁶⁶

5.5.1 Future considerations: Farsh El Za'tar experimental orchard and the high mountains watershed management model

Several reasons account for the low priority profile of desert ecosystems. A deeply held belief associating the desert with risk, uncertainty and hardship, has halted the process of building a scientific base for the arid ecosystem (in Arab Republic of Egypt) (UNEP, 2006).

Since late 1940s-1960s CE, due to the irregularity of the rainfall in Sinai Peninsula, a less attention was given to runoff water harvesting in favor of groundwater studies-hydro-geological, hydro-chemistry, hydro-physical-springs (e.g. Qadeirat and Qusaima) and distant water

heavy burden of maintaining the projects led to their abandonment." (Shanan, 2000)

⁶⁶ "By the end of the participatory appraisal and planning exercises....the project and interested communities has identified 177 'physical activities'....Some infrastructure (e.g. small-scale irrigation schemes) didn't meet technical requirements. Existing or potential social conflicts negatively affected other activities." (Warren, 1998).

pipelines to predetermined classical development vicinities (i.e. historical axis of human mobility; later on, traditional axis of research), which are perceived as a more reliable source of for commercial agriculture 'mass-production' and small-medium size local communities establishment 'domestic consumption' (Sinai Encyclopedia, 1960).⁶⁷ On the other hand—for the same reasons—the Agriculture in the Negev Desert is increasingly relying on the water from the north and the springs in-situ (e.g. Avrona, Radian, Yahav, Tamar, Marsev, Hatzeva, Amatzياهو, Hakikar and Avdat) (Evenari et al., 1971) (Regev, Berkofsky et al. ed., 1981).⁶⁸ External water pipelines

⁶⁷ Since late 1940s-1960s CE, the consecutive governments of the Arab Republic of Egypt are operating experimental farms at Rafah (i.e. established in 1947 on 15.1 hectares), El Arish (i.e. established in 1952 on 29.4 hectares and another 3.8 hectares), and one in the vicinity of Ruafa water dam, in addition to the 29.4 hectares agriculture support program at W. El Qusaima 'Ain Qadeirat' in mid 1950s. The experimental farms were based on groundwater irrigation and best adaptable crops allocation (i.e. where vines, olives, almonds, figs, apples, lemons, apricots, peaches, peers, plums and other microcatchments are in-use). In 1956, El Arish and Rafah experimental farms were destroyed—reconstructed later on—during the Suez Crisis upon the occupation of Sinai Peninsula by the Israeli Defence Forces 'IDF'. In 1950s-1960s, the United Nations 'UN' represented in the United Nations Relief and Works Agency for Palestine Refugees 'UNRWA' had an interest in the agricultural reclamation and water resources investigations and surveys at North and Central Sinai (UNRWA, 1954) (Sinai Encyclopaedia, 1960).

"Irrigated agriculture will provide employment, food, raw materials for industry, and exports. The process of introducing irrigation is a long one, and will have rather slow initial returns on investment. The required chain of activities includes soil studies, water conveyance design and construction, land preparation, crop establishment (based on adaptive research), processing and storage plants, and penetration of distant Egyptian and export markets....rural development programs, which also include a cluster of activities....water wells, dams, dikes, cisterns, warehousing, transport services, training, credit, marketing, small animal production, agro-forestry, revegetation of grazing lands, renewable energy, improvement of livestock and crop varieties, poultry, self-housing, and small-scale mechanization." (Dames & Moore, 1979-1985)

⁶⁸ The Arava Valley spring-based settlements stabilizes the borderline—past frontier—between the newly born state of Israel and the Hashemite Kingdom of Jordan, as the agricultural fields are located within a relatively small range for water supply and security reasons, similar to the ancient towns of the Negev Desert (i.e. ex- Roman Provincia Arabia frontier) (Shanan, 2000).

and high yield springs are not the economically feasible options for the remote areas of the High Mountains of Sinai Peninsula.

Accounting to the socio-ecological and socioeconomic importance of the irregular runoff and shallow groundwater at the remote mountainous vicinities, there is no doubt that the future Farsh El Za'tar experimental orchard would act as a keystone in achieving the following:

- 1 a representative watershed for the High Mountains of Sinai Peninsula under natural setting, eliminating any record-keeping under human intervention in the natural water resources cycle and/or time structure of the environment
- 2 conduction of a watershed management model for the entire mountain range in practice, based on extensive meteorological and hydrological data⁶⁹
- 3 elimination of the unsustainable negative impacts of the newly introduced water storage dams in favor of the empowerment of developed traditional ones
- 4 medicinal plants mass-production in-situ, enforcing the rising supportive-economical activities at remote areas
- 5 investment in the micro value of the mountain range
- 6 provision of a comparative case-study–Middle East–with other global mountain ranges for interdisciplinary ecosystem assessments

Historically and contemporarily, a crucial bottom line fact must be highlighted that the main reason which stands behind the sustainability and/or abandonment of semi-arid and arid zones' projects:

The area is under the control of a strong central authority that has a political will and competence to plan and operate the systems and enforce regulations for water rights and water distribution procedures. The agricultural sector includes farmers who are willing

⁶⁹ Farsh El Za'tar experimental orchard must acquire a solid partnership between the governmental institutions and national-international universities/organizations for long-term record-keeping (i.e. operating costs), not just a pilot project (i.e. 3-5 years), followed by the discontinuation and loss of the record-keeping process.

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to introduce and use new techniques. An economic and social structure that doesn't rely only on agriculture for its livelihood but insures a satisfactory and stable income from several productive economic sectors....The strong central authority that planned and operated the systems was replaced by one that was incapable of managing them (Shanan, 2000).

PART III

6. Trans-border and domestic impact on micro-local governance decentralization, heritage planning and multilevel monitoring

6.1 Blind centralized governance

The concept of sustainability is fairly new in Egypt, especially at district and governorate levels where a full comprehensive of the trajectory that sustainability leads to its infancy. As a result, a gap still remains in addressing ecological and socioeconomic problems at district level. In Egypt, there is a growing need for an integrated cross-sectoral approach to reconciling apparent conflict that alienates those living in the desert....“as an example”....As part of the project activities, different stakeholders, including senior officials, NGO representatives and decision makers, made visits to the assessment site, and to Wadi Sheikh Hemid in particular, to see the damage caused to the area. However, none of these efforts has yielded any positive change that may help improve the quality of the environment in El Maghara “North Sinai”. The long descriptive report published in Al Ahram, a paper widely distributed in Egypt, made it very clear that truly valuable assets are being systematically destroyed. Nevertheless, no official response was made and the report went unheeded (UNEP, 2006).

Due to the fact that centralization and sub-optimization are the dominating features over most of the sectoral and governance administrative and financial decisions, the Arab Republic of Egypt suffers extensively from mismanagement, lack of efficient financial resources allocation, and the relative absence of both data-based and/or specialist-based decisions on the micro-local level. In other words, the decisions over the past decades within the incorruption case-studies were subjected to relatively inefficient plans and inaccurate estimates due to the quality and quantity of data; in addition to the infeasible capacity of the centralized governmental institution in terms of specialization and/or workload to plan for the entire country on municipal level, besides the strategic one. The high investments and over reliance on disciplinary and/or interdisciplinary city/urban-based consultants on the expense of establishing efficient rural-based local-micro governance, and supported by university(ies) and/or institutional research and studies, it grafted any opportunities in

establishing long-term micro-local specialized governance committees (i.e. bureaucrats). Although the following quote does not reflect on the mentioned consultant by the author, but it certainly reflects to great extent on the situation in the Arab Republic of Egypt, regarding both domestic-national/international ones, at least prior January, 25 2011 CE (Dames & Moore, 1979-85) (SEAM, 2003-2004) (SSRDP, 2006) (UNEP, 2006) (Shams, 2011e):

The meeting gave Mensky, the newly elected secretary of Hasolelim “Kibbutz”, an overwhelming feeling that it was time to take action. He perceived his election as a mandate for change. To explain the process, he again resorts to the aircraft metaphor: “a consultant who works in the public domain, with businesses and municipalities, specializing in the process of change” was in the control tower; I was the pilot. If we got it wrong, I would die in the crash. He would remain unhurt, so his stake wasn’t the same as mine (Gavron, 2000).

The high turnover rate of semi-specialized micro-local Nile Valley employees (i.e. reverse migration and transit jobs) and the short/medium-term presence of the disciplinary and/or interdisciplinary specialists (e.g. Nile Valley consultants and international/Western funds’ capacity-building schemes for Nile Valley and Bedouin citizens) have a deep negative impact on the bounded rationality, represented in time and money. Each newly introduced short-medium term project (i.e. three-five years) consumes unjustified time and financial resources—sustainable development cost-benefit basis—in acquiring micro-local knowledge and understanding of interest (i.e. stage one: one-two years) till it proceeds with the socioeconomic and socio-ecological impact stage (i.e. stage two: two-four+ years); hence that sub-optimization is the main cause of duplication in the consumption of the financial resources on the micro-local and macro-regional levels. There is no doubt that the High Mountains of Sinai Peninsula falls under the same previously mentioned circumstances with a partial exception as a result of being a relatively studied area-region of interest on the expense of other micro-local communities, showing another face of centralized governance (i.e. unbalanced municipal development).

6.2 Municipal governance and social structures

The High Mountains of Sinai Peninsula (i.e. one town 'urban center' and ten rural settlements') falls within the boundaries of Katharina Municipality—within a nature reserve—in South Sinai Governorate (i.e. five centres, eight towns 'municipality(ies)', 14 local units, 14 villages and 83 localities) (South Sinai Governorate, 2006) (Shams, 2011e). The information about the classification of the rural settlements within the mountain range or the detailed governance composition of Katharina Municipality are inaccessible to the author by the time of the study; nevertheless, the lack of information does not impact by any means the proposed governance structure. The mountain range is being subjected to a planning and conservation double Veto by St. Catherina Natural Protectorate (PAMU, 2003) and a Name and Shame one by the United Nations Educational, Scientific and Cultural Organization 'UNESCO' (i.e. in 2002 CE, World Heritage Site No. 954 'Cultural Landscape') (ICOMOS, 2002) (UNESCO, 2008). Post the Egyptian National Reforms Revolution of January, 25 2011 CE, the need for a decentralized governance structure in the Arab Republic of Egypt—precisely in remote desert and mountain regions—surfaced once again as one of the very vital demanding reforms for sustainable development. In fact, the permanent central government disciplinary representation decreases on top-down approach basis, almost diminishing on micro-local level. Due to the total inexistence of any decentralized governance basis on the micro-macro levels, the neo proposed municipal governance structure under this research-study would be introduced on two phases:

- 1 initial elections and appointments semi-decentralization phase 'five-ten years' (i.e. education and socioeconomic leverage phase) (Fig. 66)
- 2 micro-local financial resources decentralization phase (i.e. full democratization phase)

In this perspective, the research-study discusses several decentralization stages within phase one in terms of governance and social structures, organizational functions and interdisciplinary tasks, and multilevel monitoring in the light of sustainable development and economic conservation of natural-cultural resources (Weintraub, 1971) (Gavron, 2000) (PAMU, 2003) (Shams, 2011e).

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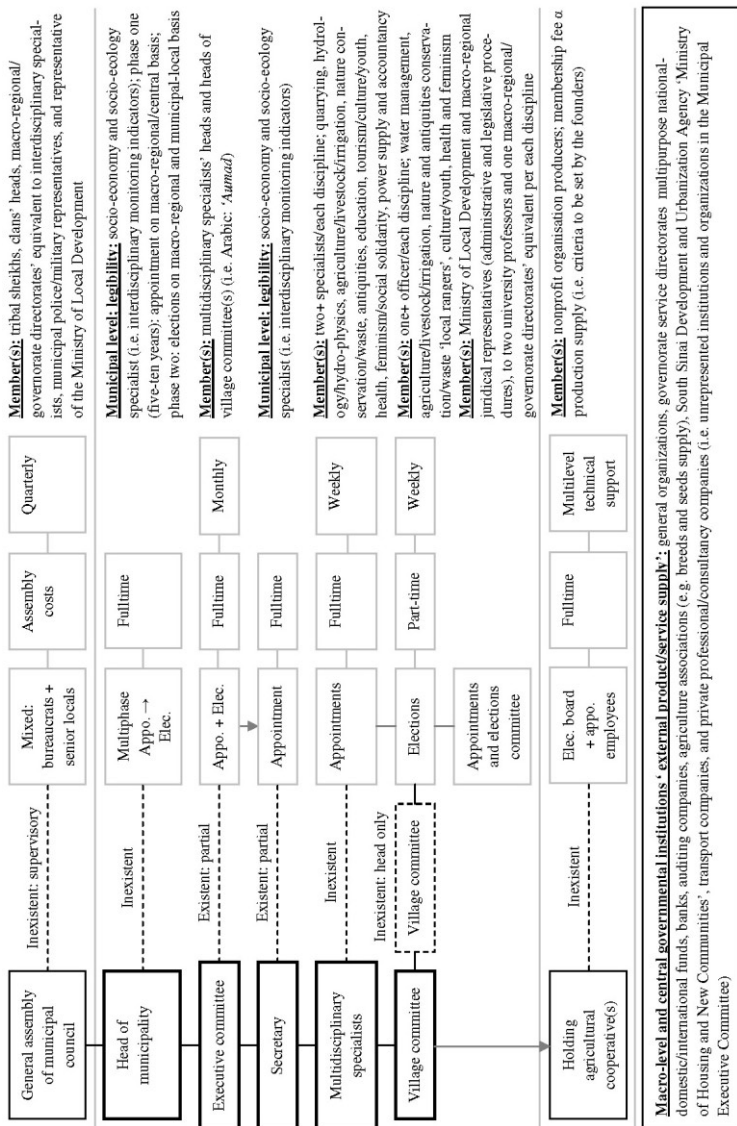


Figure 66 The High Mountains of Sinai Peninsula 'Katharina Municipality' organizational blueprint 'phase one': initial appointments for neo municipal governance structure

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Paradoxically and comparatively in the adjacent Negev Desert to Sinai Peninsula, and apart from the legitimacy and ownership argument in the Middle East (i.e. political consolidation) along with unfortunate lack of unbiased potential final beneficiaries, the very well documented accounts of Dov Wientraub and Daniel Gavron, *'Immigration and Social Change: Agriculture Settlements of New Immigrants in Israel'* and *'The Kibbutz: Awakening form Utopia'* respectively, both describe socioeconomic and cultural experiments which took place on the historical land of Palestine:

- 1 the Moshavim agricultural settlements
- 2 the Kibbutzim multi-economical settlements

There is no quarter to discuss the governance and social structures apart of the economical one, in addition to the potential geopolitical factor in trans-border regions such as the Sinai Peninsula and the Negev Desert. Accordingly, the newly born State of Israel prior the privatization of the Kibbutzim by late 20th century CE had put Capitalism and Socialism too close, under differential and dynamic political and economical purposes:

The idea was developed further in *The New Kivutz*, published by Yehuda Harel of Kibbutz Merom Gollan in 1993. Harel asserted that the kibbutz had failed in production he argued, whereas capitalism had failed in distribution. He suggested a model for capitalist production combined with socialist distribution (Gavron, 2000).¹

Globally, the Moshavim and Kibbutzim settlements are the focal point of the current political conflict between West and East on a broader context (i.e. past economical debate); nationally–identity of

¹ In 1999 CE, an amendment to the Supplementary Kibbutz Agreement of 1989 CE was signed (i.e. debt settlement and recovery plan), allowing Israel's first capitalist kibbutz: "Even today, the kibbutz plays an important role in the Israeli society and makes a notable contribution to the nation. Less than three percent of the population, the kibbutzim still grow and raise 40 percent of the country's agricultural produce, make ten percent of its industrial output, and produce seven percent of its exports. Half of the volunteers of the army's elite combat units and nearly a third of its air force pilots are children of the kibbutz. Almost a fifth of the army's young officers are kibbutniks....The rural sector has never been isolated from, or dominated by, the urban one." (Gavron, 2000)

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state under national-international debate—they differentially put the European and Eastern social structures under comparative governance approach and production systems (i.e. apart from the Palestinian Arabs of Israel), represented in the European Jews and Mizrahi Jews (i.e. including Arab Jews):

We did not play our part in absorbing the oriental immigration. I blame the Eastern Europeans. We Yekkes (German Jews) have a more positive approach to the Middle Eastern Jews (Haim Zeligman: Gavron, 2000)....It was the 1950s and 1960s that the moshav cooperative village came into its own. The new immigrants from the Middle Eastern countries found the looser cooperative from the moshav far more to their liking than the tight communal structure of the kibbutz. Hundreds of new moshavim were established, the cities expanded, and some twenty new towns, called “development towns” where built on all parts of Israel (Gavron, 2000).

By all means the Moshavim and Kibbutzim are considered as a complex and diverse governance and socioeconomic structures, acting as a pool of sub-models and experiments in practice, but not as best-practice case-study due to their argumentative Zionist geopolitical role in the establishment and continuous expansion of the political borders of the newly born State of Israel—land and natural-cultural resources confiscation by military power—on the expense of the dual state solution (i.e. State of Israel side by side to a Palestinian State on the historical land of Palestine):

When the United Nations voted in 1947 to partition Palestine between Jews and the Arabs, it was largely the geographic positions of the various kibbutzim that determined the borders of the Jewish state (identity of state under national-international debate), and the settlements played a notable part in defending those borders when war broke out (Gavron, 2000).

6.3 Initial elections and appointments of the semi-decentralization phase

In practice, several current—May 2012 CE—factors forces the adoption of the neo municipal governance structure—organizational blueprint—in figure one for the initial elections and appointments semi-decentralization phase:

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- 1 the partial existence of multidisciplinary specialists on the macro-regional level, not on the micro-local one
- 2 the cross-sectoral affiliation status of partially existent multidisciplinary specialists between the institutions of central government (i.e. ministries and general organizations),² macro-regional ones (i.e. National Authority for the Development of the Sinai Peninsula, and governorate directorates)³ and other small-scale presence on micro-local level (i.e. municipal offices)
- 3 the full control of the central government in Cairo on the national budget allocation (i.e. development need-based allocation policy, along with the existence of dozens of under-funded municipalities nationwide)⁴
- 4 the shortage in the multidisciplinary specialists on the micro-local/municipal levels (i.e. major inexistence of multidisciplinary specialists among the permanent residents)

All the previously mentioned factors acts as a decentralization barrier–capacity to modernize (Weintraub, 1971)–raising a need for a semi-decentralization transition phase under a neo municipal governance structure, to be introduced and implemented via an uncorrupted and unbiased democratic process in order to enable the following (not limited to):

² General organizations: Educational Buildings; Regional Tourism Development; Egyptian Religious Endowments; Health Insurance; Roads and Bridges (South Sinai Governorate, 2012).

³ Ex-Sinai Development Authority; governorate service directorates: Management and Administration; Roads and Transport; Housing and Utilities; Water Resources; Agriculture; Education; Culture; Youth and Sports; Social Solidarity; Supply and Internal Trade; Health; Veterinary Medicine; Manpower; Finance; Real Estate Tax; Al-Azhar ‘religion authority’; Endowments; Antiquities (South Sinai Governorate, 2012). Some directorates should merge according to the classification of the multidisciplinary specialists.

⁴ Some of the under-funded municipalities have direct and indirect sufficient public income, or at least the potentiality to finance their sustainable development needs (e.g. St. Catherine Natural Protectorate/High Mountains of Sinai Peninsula/Katharina Municipality). It is a wasted opportunity due to the infeasible governance structure, mismanagement and/or corruption (Grainger et al., 2008) (Shams, 2011e).

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- 1 decentralized governance and decision making process
- 2 nationwide democratization
- 3 nationwide population redistribution and anti-reverse migration incentives (i.e. desert and mountain regions to the Nile Valley)
- 4 job creation on micro-local/municipal level
- 5 local community empowerment
- 6 financial resources allocation and cost deduction
- 7 sustainable/permanent direct multidisciplinary support to local people
- 8 establishment and development of socioeconomic and socio-ecological impact-oriented databases (i.e. production systems support)

6.3.1 The elections and appointments committee⁵

This temporary committee is composed of two groups:

- 1 supervisory group (i.e. two members): Ministry of Local Development–central government audit–and macro-regional juridical representative(s) who assure the right implementation of the administrative and legislative procedures
- 2 executive group (i.e. 33 members: three/each discipline): two university professors and single representative per each equivalent macro-regional/governorate directorate

On one hand, the full members of the executive group perform the following tasks:

- 1 preparation of employment-job shortlists per each discipline (i.e. multidisciplinary committees: the appointment of the multidisciplinary specialists per committee)
- 2 publication of shortlists

⁵ The listed tasks under section three are a modified version–amendment–being customised and based on the organizational blueprint of the Moshavim and the St. Catherine Protectorate Management Plan (Weintraub, 1971) (PAMU, 2003).

3 final selection for the appointments

On the other hand, the supervisory group and the single representative per each macro-regional/governorate directorate perform the following tasks:

- a preparation of candidates' list (i.e. villages' committees: elections of officers and heads–*Arabic*: 'Aumad–per each village) and supervise the employment-job shortlisting procedures per each discipline
- b publication of candidates' list
- c conduction of the elections (Weintraub, 1971)

Accordingly, the appointments and the elections lead to the formation of the following: i) basically, 22+⁶ members/specialists per 11 disciplinary committees (i.e. 6+ committees include the members/officers of the villages' committees) [total/municipality: 22+ fulltime specialists + (6 part-time officers x no. of villages)]; ii) single head/'Aumda and the same 6 officers per village committee [total/municipality: (one fulltime 'Aumda + 6 part-time officers 'previously counted') x no. of villages)]. Therefore, a total of (22+ fulltime professionals) + (one fulltime local x no. of villages) + (6 part-time local officers x no. of villages) + (more nature and antiquities conservation officers 'local rangers') + (other officers and/or outsourcing option; e.g. youth clubs) vacancies and promotion opportunity per municipality are created and overlapped between the executive, disciplinary and villages' committees.⁷

6.3.2 The executive and disciplinary committees

As a result of the previously discussed elections and appointments, the executive committee is composed of the multidisciplinary specialists'

⁶ (+) refers to the additional number of specialists and/or officers per municipality according to the environmental, social and economical needs/capacity.

⁷ All the new posts (i.e. specialists and/or officers) would be opened to the already existing municipal employees and outsiders after publishing the neo municipal governance structure–organizational blueprint–in the official gazette and its dissemination on the micro-local/municipal and macro-regional/governorate.

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heads and villages' committees heads (i.e. 'Aumad), while the disciplinary committees are classified into the following (i.e. tasks not limited to):

- 1 common tasks
 - a monitoring (Tab. 37)
 - b capacity-building and technical support
 - c study and research
 - d archiving and documentation
 - e holding monthly inter-municipal coordination meetings on the equivalent specialization level (i.e. attendance of the equivalent macro-regional directorate representative)
- 2 geology/quarrying
 - a setting quarrying zones and regulations
 - b licensing of ornamental rock, building material and minerals commercial exploitation, in addition to rock collection
 - c supervising the restoration of the quarrying sites by the utilization of granite waste, re-profiling sand and gravel borrow pits' spoil tips
- 3 hydrology/hydro-physics
 - a evaluating water use in term quantity and quality
 - b allocating water quotas to rural-urban households (i.e. portable and pipeline supplies)
 - c conducting and developing a watershed management plan
 - d licensing groundwater wells and water dams construction
- 4 agriculture/livestock/irrigation
 - a evaluating agriculture land use capacity
 - b crop rotation
 - c composition of crops
 - d developing dry farming

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- e planting poultry branch plantations
- f new plantations (e.g. medicinal plants)
- g developing and ameliorating livestock (i.e. veterinary services)
- h planning fodder supply
- i irrigation works
- j pest control
- 5 nature conservation/waste management
 - a setting management and buffer zones (i.e. out of action St. Catherine Natural Protectorate Management Zones)
 - b conducting Environmental Impact Assessments 'EIAs' for the new/current projects, quarrying activities and construction works in collaboration with other municipal committees (i.e. EIA is the lead committee)
 - c surveying biodiversity (i.e. flora and fauna)
 - d controlling medicinal and wood plants collection
 - e overgrazing control
 - f supervising sanitation and waste collection, separation and recycling at the municipal waste station
- 6 antiquities
 - a setting management and buffer zones for the officially registered and unregistered sites
 - b developing conservation and reuse, plans and regulations
 - c surveying archaeological sites
- 7 education/public awareness
 - a setting customized education strategy—up to 30% on micro-local/macro-regional basis—in collaboration with other municipal committees (i.e. science, history and geography classes on natural-cultural heritage conservation basis)

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- b organizing fieldtrips and volunteering work in collaboration with other municipal committees
- c planning and developing school educational material (e.g. books) and equipments/devices (e.g. laboratories), in addition to illustrative teaching methods (e.g. maps and charts)
- d disseminating socioeconomic and socio-ecological knowledge in practice to all stakeholders in collaboration with other municipal committees (e.g. advice-based heritage conservation-preservation approach)
- 8 tourism/culture/youth
 - a planning municipal/inter-municipal hiking trails and off-road dirt tracks (i.e. tourists management plan)
 - b supervising the museums, tourist visitors center and tickets office
 - c designing and disseminating brochures and pamphlets about tourist destinations and cultural events
 - d conducting tourist surveys
 - e signposting in urban-rural areas and on trails-tracks
 - f planning, developing and managing specialized–interdisciplinary–and general knowledge public library (i.e. books and maps)
 - g organizing cultural events, extrusions, open-air cinema shows, social gatherings and artistic groups
 - h organizing seminars and conferences
 - i supervising youth clubs
 - j orienting sessions and excursions for the new municipal residents
- 9 health
 - a planning household-based medical insurance plan in collaboration with the feminism/social solidarity committee, including special health problems
 - b introducing, developing and supervising the hospital(s) (e.g. operation room(s) and blood bank), clinics, mobile medical campaigns to remote areas and/or first aid units

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- c training a mountain rescue team (i.e. accomplished by St. Catherine Natural Protectorate in 1996-2003 CE)
- 10 feminism/social solidarity
 - a conducting demographic surveys (i.e. housing, population census...etc.)
 - b evaluating household standard of living (i.e. social welfare)
 - c planning and implementing women empowerment (e.g. household products) and child care program(s)
 - d organizing the distribution of governmental subsidizes
- 11 power supply/fuel/energy control
 - a developing power distribution plans and forecasts (i.e. networks and generators)
 - b supervising the imported fuel supply to rural-urban areas and firewood supply to remote areas
 - c introducing renewable energy sources (e.g. solar panels, stoves and cookers)
- 12 accountancy/legislation
 - a budgeting plans
 - b conducting balance sheets and financial reports
 - c providing monthly payments and logistics cost, according to the degree of centralization and national financial resources allocation plans (Weintraub, 1971) (Dames & Moore, 1979-85) (PAMU, 2003), (SEAM, 2003-2004) (UNEP, 2006) (Shams, 2011e)

6.3.3 The municipality head and secretary

Based on the neo municipal governance structure—organizational blueprint—the secretary is appointed by the multidisciplinary specialists' heads. The municipal secretary plays a vital quality management and assurance role with a socio-economy and socio-

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Table 37 Disciplinary committees monitoring, licensing and report system: micro-local/municipal level blueprint

	Daily	Weekly (Committee Meeting)	Monthly (Executive Meeting)	Quarterly (General Assembly) ⁸	Semiannual (General Assembly)	Annual Strategic Plan Assessment (General Assembly)
Common Issues	<ul style="list-style-type: none"> - Task planning, management, organization and supervision - Capacity-building and technical support - Study and research - Archiving and documentation 		<ul style="list-style-type: none"> - Evaluation report to head of municipality/secretary and macro-regional directorate equivalent - Permissions for destructive methods research-study 	<ul style="list-style-type: none"> - Evaluation report to head of municipality/secretary, macro-regional directorate equivalent and general assembly - Macro-regional audit 	<ul style="list-style-type: none"> - Evaluation report to head of municipality/secretary and macro-regional directorate equivalent 	<ul style="list-style-type: none"> - Evaluation report to head of municipality/secretary and macro-regional directorate equivalent
Geology/ quarrying		<ul style="list-style-type: none"> - Quarries monitoring 	<ul style="list-style-type: none"> - Provision or prohibition of quarrying 	<ul style="list-style-type: none"> - Quarries' reserves impact- 	<ul style="list-style-type: none"> - Review the quarrying zones, 	<ul style="list-style-type: none"> - Review the quarrying zones,

⁸ The quarterly general assembly meeting might be cancelled post the first five years according to the stability status of the neo municipal governance structure.

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		licenses; outsourcing contracts (i.e. municipal recommended decision/ governorate final one)	capacity monitoring	regulations ⁹ and licenses; outsourcing contracts; indicators- indexes	regulations and licenses; outsourcing contracts; indicators- indexes
Hydrology/ hydro-physics	- Water quantity/ quality monitoring (i.e. rural- urban and remote areas 'mountains- valleys' sampling)	- Provision or prohibition of licenses for new groundwater wells and water dams construction; outsourcing contracts - Allocation of new water quotas ** ¹⁰	- Water quantity/ quality impact- capacity monitoring (i.e. rural- urban and remote areas 'mountains- valleys' sampling)	- Review the groundwater wells and water dams construction zones, regulations and licenses; outsourcing contracts; watershed management plan;	- Review the groundwater wells and water dams construction zones, regulations and licenses; outsourcing contracts; watershed management plan;

⁹ For all committees, any amendments in zones and/or regulations of interest must be approved by the equivalent directorate/committee at the macro-regional/governorate level. Not less than five-crisis situation—to ten years—end of phase one—lapse must be allowed between each successive zones and/or regulations amendments for policy stability.

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Agriculture/ livestock/ irrigation				water supply, reserves and quotas; indicators- indexes	water supply, reserves and quotas; indicators- indexes
	- Agriculture land use, irrigation works and livestock farms monitoring (i.e. rural- urban and remote areas 'mountains- valleys')	- Provision or prohibition of new agriculture land, irrigation works and livestock farms, ownership/ leaseholds and licenses; outsourcing contracts**	- Agriculture land use, irrigation works and livestock farms capacity monitoring (i.e. rural- urban and remote areas 'mountains- valleys')	- Review the agriculture land, irrigation works and livestock farms, zones, regulations, ownership/ leaseholds and licenses; outsourcing contracts; indicators- indexes	- Review the agriculture land, irrigation works and livestock farms, zones, regulations, ownership/ leaseholds and licenses; outsourcing contracts; indicators- indexes
Nature conservation/	- Biodiversity and waste	- Provision or prohibition of	- Biodiversity and waste	- Review the biodiversity	- Review the biodiversity

¹⁰ (**) refers to the act that the municipality holds final decision on household level activities, while it holds a recommended decision in favor of a governorate final one on community/commercial level activities (i.e. two sets of identification criteria are to be conducted to set the upper and lower limits of each level).

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waste management	management monitoring (i.e. rural-urban and remote areas 'mountains-valleys')	new Environmental Impact Assessments 'EIAs' permissions; vegetation exploitation licenses; outsourcing contracts**	management impact-capacity monitoring (i.e. rural-urban and remote areas 'mountains-valleys')	and waste management zones, regulations, EIA permissions and vegetation exploitation licenses; outsourcing contracts; indicators-indices
				and waste management zones, regulations, EIA permissions and vegetation exploitation licenses; outsourcing contracts; indicators-indices
Antiquities	- Archeological sites conservation status, reuse and visitors impact monitoring (i.e. rural-urban and remote areas 'mountains-valleys')	- Provision or prohibition of new reuse and archaeological surveys permissions (reuse: e.g. ancient irrigation systems and agricultural plots)**	- Archeological sites conservation status, reuse and visitors impact-capacity monitoring (i.e. rural-urban and remote areas 'mountains-valleys')	- Review the archeological sites management and protection zones and regulations; reuse and study-research permissions; outsourcing contracts; indicators-
				- Review the archeological sites management and protection zones and regulations; reuse and study-research permissions; outsourcing contracts; indicators-

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				indexes	indexes
Education/ public awareness	- Customized education system and public awareness campaigns monitoring (i.e. rural-urban and remote areas 'mountains-valleys')	- Provision or prohibition of new public awareness campaigns; outsourcing contracts (i.e. municipality holds final decision for nonpolitical and unreligious issues and up to a predetermined budget; Middle East sensitivity issues)	- Customized education system and public awareness campaigns impact-capacity monitoring (i.e. rural-urban and remote areas 'mountains-valleys')	- Review the customized education system and public awareness permissions; outsourcing contracts; indicators-indexes	- Review the customized education system and public awareness permissions; outsourcing contracts; indicators-indexes
Tourism/ culture/youth	- Tourism, culture and youth	- Provision or prohibition of new	Tourism, culture and youth	- Review the tourism management	- Review the tourism management

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	infrastructure (e.g. trails/tracks network), activities and events monitoring (i.e. rural-urban and remote areas 'mountains-valleys')	activities and events permissions and licenses; outsourcing contracts (i.e. municipality holds final decision up to a predetermined budget)	infrastructure (e.g. trails/tracks network), activities and events impact-capacity monitoring (i.e. rural-urban and remote areas 'mountains-valleys')	zones and regulations; activities and events permissions and licenses; outsourcing contracts; indicators-indexes	zones and regulations; activities and events permissions and licenses; outsourcing contracts; indicators-indexes
Health	- Health service system monitoring (i.e. rural-urban and remote areas 'mountains-valleys')	- Provision or prohibition of health service system outsourcing contracts (i.e. municipal recommended decision and governorate final one)	Health service system impact-capacity monitoring (i.e. rural-urban and remote areas 'mountains-valleys')	- Review the health service system management zones and regulations; outsourcing contracts; indicators-indexes	- Review the health service system management zones and regulations; outsourcing contracts; indicators-indexes
Feminism/	- Household	- Provision or	- Household	- Review the	- Review the

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social solidarity	standard of living and socioeconomic status monitoring (i.e. rural- urban and remote areas 'mountains- valleys')	prohibition of outsourcing contracts (i.e. municipal recommended decision/ governorate final one)	standard of living and socioeconomic status impact- capacity monitoring (i.e. rural- urban and remote areas 'mountains- valleys')	outsourcing contracts and indicators- indexes	outsourcing contracts and indicators- indexes
Power supply/fuel/ energy control	- Power supply, fuel and renewable energy dissemination monitoring (i.e. rural- urban and remote areas 'mountains- valleys')	- Provision or prohibition of outsourcing contracts (i.e. municipal recommended decision and governorate final one)	- Power supply, fuel and renewable energy dissemination impact- capacity monitoring (i.e. rural- urban and remote areas 'mountains- valleys')	- Review the outsourcing contracts and indicators- indexes	- Review the outsourcing contracts and indicators- indexes
Accountancy/ legislation	- Financial statements,	- Contracting and budgeting		- Review the contracting	- Review the contracting

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	sheets and reports	execution	and budgeting regulations	and budgeting regulations

ecology background (i.e. interdisciplinary monitoring indicators).¹¹ It is a crucial role, enabling higher inter-committees integration, as the secretary acts as a facilitator who bridges both technical and political roles, represented in the disciplinary committees and the municipality head respectively.

Tangibles: the physical appearance of facilities, equipment, personnel, & communication material;

Convenience: the availability and accessibility of the service;

Reliability: the ability to perform a service dependably, consistently, and accurately;

Responsiveness: the willingness of service providers to help customers “citizens” in unusual situations and to deal with problems;

Time: the speed with which service is delivered;

Assurance: the knowledge is exhibited by personnel who come into contact with a customer “citizen” and their ability to convey trust and confidence;

Courtesy: the way customers “citizens” are treated by employees who come into contact with them (Stevenson, 2005).

Standardization of operations management, and the evaluation documents and reports per each disciplinary committee on an inter-municipal level is the keystone for an efficient quality management and assurance process. It has to be implemented post the elections and appointments of the disciplinary committees (i.e. specialists and officers) and prior the commencement with neo municipal governance structure. It is estimated to take six months to one year in preparation, intervened with current system reviews, assessments and pilot-surveys.

¹¹ “Total Quality Management (TQM): a philosophy that involves everyone in an organization in a continual effort to improve quality and achieve customer (i.e. final beneficiary, e.g. municipal residents) satisfaction, via continuous improvement, competitive benchmarking, employee empowerment, team approach, decisions based on facts rather than opinions, knowledge of tools, supplier quality, champion, quality at sources and suppliers are partners in the process, while using flowcharts, check sheets, pareto charts, control charts, histograms, scatter diagrams and cause-and-effect diagrams.” (Stevenson, 2005)

All documents and reports–databases–must be designed–charted to enable two main issues:

- 1 inter-municipal standardization (i.e. previously discussed)
- 2 municipal customization (i.e. special issues of interest)

Thus, the municipality head plays a political stabilization role for the central government–executive authority–who is unlikely to be elected or appointed by the elections committee nationwide and specifically in Sinai Peninsula due to its geopolitical and strategic military vitality for the Arab Republic of Egypt. Accordingly, the municipality head is most likely to be appointed as well as the governor of South Sinai, especially during phase one (i.e. semi-decentralization ‘five-ten years’: education and socioeconomic leverage phase) along with the rising political conflict–instability–between the liberals, militants (i.e. hold all executive powers ‘May 2012 CE status’) and Islamists (i.e. hold legislative powers–parliament majority–‘May 2012 CE status’) which most expectedly would last for the next five years–2012-2017 CE–if no compromise and/or decisive dramatic solution is enforced on the political scene.

6.3.4 The general assembly of municipal council

Investors are well situated in the social hierarchy. With their financial resources and good connections in influential circles that extend from local governance to the upper tier of national governance....Local Governance has the largest influence as well as the upper hand in running, supervising and managing administrative issues in the assessment area....The isolation and remoteness of El Maghara, coupled with the Bedouin’s lack of awareness, has many repercussions. The commitment and efficiency of local officials in El Maghara is rarely mentioned or audited by higher governance circles, which allows local officials an authorization and independent role (UNEP, 2006).

The General Assembly is the core auditing body on the entire municipal governance performance. It is composed of the following members:

- 1 local community representatives: tribal sheikhs and clans’ heads (i.e. community elections)

- 2 macro-regional/governorate representatives: directorates' equivalent to interdisciplinary specialists (i.e. appointed by another elections and appointments committee)
- 3 municipal police and military representatives who hold a Veto on all municipal and governorate decisions based on the Decree-law No. 14 of 2012 on the Integrated Development in Sinai Peninsula, published in the official gazette on January 19, 2012 CE (Official Gazette, 2012)
- 4 central government representative: Ministry of Local Development or the National Authority for the Development of the Sinai Peninsula (i.e. discussed below)

6.4 Trans-border and domestic implications: Decree-Law No. 14 of 2012 on the Integrated Development in Sinai Peninsula

Locally, there are high sustainability threats upon the introduction of any development projects under inefficient governance; meanwhile, the local socioeconomic needs are widely unfulfilled:

The dissolution of a traditional social structure or institution "e.g. Katharina Municipality: traditional tribal system based on customary law" does not necessarily assure the succession of a more modern pattern....Our data, though, suggest that one might well be particularly wary of the risks of failure involved in the "great leap forward" vision, whenever the stability of the institutional structure and the security of the modernized units are not well established (Weintraub, 1971).

Post the Egyptian National Reforms Revolution of 25 January 2011 CE, the High Council of Armed Forces is in charge of all presidential authorities according to an argumentative referendum on the Temporary Constitutional Declaration of February 13, 2011 CE which rules the transition phase–January 12, 2011 to June 30, 2012 CE–until the expected presidential elections in May 2012 CE. Additionally, the highly escalating cross-interest conflict between the liberals, military and Islamists, and prior the expected domination of the Islamists over the parliament in a democratic elections,¹² both forced the High Council

¹² Political analysts account the political Islamist domination over the parliament to the severe failure of Mubarak's regime in delivering the basic

of Armed Forces to issue a series of decree-laws regarding several issues of strategic national interest, including the Decree-law No. 14 of 2012 on the Integrated Development in Sinai Peninsula. This decree-law was issued prior the parliament's initial assembly in order to act as a guideline and message, reflecting two core issues:

- 1 nationwide interest in preserving the border lands with the newly born State of Israel under guard via a set of laws and regulations (i.e. Sinai Peninsula)
- 2 a predicted legislative and/or inter-executive authorities conflict between the military and the Islamists about the upper handed decision making authority on strategic issues (e.g. desert and border lands ownership and use).¹³

socioeconomic and socio-ecological needs nationwide under the cover of liberal terms such as market economy and privatization which were over consumed for corruption purposes. The Islamists have solid ground among different social classes, specifically the wide lower middle and poor ones where illiteracy is widely spread, while succeeding to deliver the needs which the consecutive governments of Egypt ignored and/or failed to deliver over the past 30 years. It is also widely perceived nationwide-Egypt, and Middle East on a broader context—that the Western states stand behind such a socioeconomic failure by supporting Mubarak's regime, based on the regime's ability in securing Western interest on the expense of the domestic-national ones without regarding any sort of relative mutual balance.

¹³ Laws: i) No. 183 of 1981 on Desert Land; ii) No. 230 of 1996 on Organization of Non-Egyptians to Own Real Estate and Land-based Space; Presidential Decrees: i) No. 531 of 1981 on Land Vacated by the Armed Forces; ii) No. 152 of 2001 on Strategic Areas of Military Importance Not to Be Owned; iii) No. 153 of 2001 on Establishment of the National Center for State Land Use Planning; iv) No. 154 of 2001 on Uses of the Territory of the State until 2017; v) No. 204 of 2010 on Identification of Areas Adjacent to the Eastern Borders of the Republic and its Governing Rules; Prime Minister Decrees: i) No. 731 of 2004 on Took Over Management of Military Survey A Database of Land to the Crisis on the Activities of Ministries within the Map of Investment Opportunities; ii) No. 548 of 2005 on Ownership and Use of Non-Egyptian Stay Units in Some Areas; iii) No. 350 of 2007 on Terms and Rules of Disposal of Land and Real Estate Located in the Sinai Peninsula; Minister of Defence Decree: i) No. 146 of 2002 on Terms and Rules Required by the Defence Affairs of the State in the Desert Lands of Bodies and Authorities Set Forth in Law No. 183 of 1981 on Desert Land; (ii) No. 203 of 2012 on Ban ownership or the right of utilization, lease or make any type of behavior in the land and real estate in strategic areas of military importance and also prohibits land of Sinai Peninsula to non-

Nevertheless, the very special position of Sinai Peninsula in the Egyptian legislation establishes a double standard situation; on one hand, all the previously mentioned might radically enforce the governance system to maintain the past thirty years absolute centralization with dozens of constraints; on the other hand, it might be a rescue for Sinai Peninsula from a pool of unlikely resolved development problems nationwide on a medium term period—three-five years—in order to qualify the implementation of a similar neo municipal governance structure throughout the entire country. In other words, there is a potential opportunity to positively utilize the special position of Sinai Peninsula in the Egyptian legislation in practice, *if and only if* it falls under an open minded militants' Veto (i.e. Ministry of Defense), balancing between both security and development needs.

According to the Decree-law No. 14 of 2012, the National Authority for the Development of the Sinai Peninsula would be established as an economy-based general authority under the direct supervision of the prime minister (i.e. semiannual evaluation report).¹⁴ The director of the authority is appointed—Prime Minister Decree—upon the recommendation of the Minister of Defense, as its voting members represent the ministries, governorates, general intelligence agency, general organizations, head of people's council in Sinai Peninsula, and the development companies and investors (i.e. selected by the prime minister). The Ministry of Defense, Ministry of Interior Affairs and General Intelligence Agency hold a Veto over any decision by the authority's board. Hence, the authority is in charge of setting the strategic plan, general policy, executive regulations and auditing, regarding development and investment proposals, land use and pricing, development zones licensing, inter-sectoral coordination, prohibition of licenses in case of contracting terms' violation, agreements and protocols, financial resources allocation, previously conducted studies evaluation and completion, consultancy services, legislative proposals, socioeconomic studies, dissemination and promotion of the development and investment opportunities, and supervision on all foreign funds by organizations, institutions, nongovernmental organizations 'NGOs' and individuals. In this sense,

Egyptians (Official Gazette, 1981a, 1981b, 1996, 2001a, 2001b, 2001c, 2001d, 2002, 2004, 2005, 2007, 2010a, 2010b, 2012a, 2012b).

¹⁴ The head office is located in North Sinai, supported by other local and district offices.

the authority would act under a degree of independence, holding all the powers and playing the role of the central government in Sinai Peninsula. Therefore, the governance hierarchy during the proposed phase one—semi-decentralization ‘five-ten years’: education and socioeconomic leverage phase—would be represented top-down in the National Authority for the Development of the Sinai Peninsula, North and South Sinai Governorates and municipalities.

Actually, it is remarkable in article seven that the Ministry of Antiquities and the Ministry of Environmental Affairs do not have representative members in the authority’s board. There is no clear reason behind the delisting of both ministries. Apparently, the delisting marginalizes and/or avoids any other internal direct *Veto* over the decision of interest, mainly for the land use issue based on the rectified international conventions,¹⁵ Law No. 3 of 2010 on the Protection of

¹⁵ a. Convention for the Protection of Cultural Property in the Event of Armed Conflict (May 14, 1954), Protocol I: signature on December 30, 1954; ratification on August 17, 1955; Protocol II (March 26, 1999): signature on October 9, 1999; ratification on August 3, 2005

b. Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property (November 14, 1970): acceptance on April 5, 1973

c. Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar –February 2, 1971): ratification on September 9, 1988; Protocol I (December 3, 1982); Protocol II (May 28, 1987)

d. Convention concerning the Protection of the World Cultural and Natural Heritage (November 16, 1972): ratification on February 7, 1974

e. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES – March 3, 1973): accession on January 4, 1978

f. Convention on the Conservation of Migratory Species of Wild Animals (CMS – June 23, 1979): signature

g. United Nations Convention on the Law of the Sea (UNCLOS – December 10, 1982): signature on December 10, 1982; accession/ratification on August 26, 1983

h. United Nations Framework Convention on Climate Change (May 9, 1992): accession/ratification on December 5, 1994

i. Convention on Biological Diversity (June 5, 1992): ratification on June 2, 1994; Cartagena Protocol: ratification on March 21, 2004; Nagoya Protocol: unsigned; Nagoya - Kuala Lumpur Protocol: unsigned

j. UNIDROIT Convention on Stolen or Illegally Exported Cultural Objects (June 24, 1995): unsigned

Antiquities, Law No. 102 of 1983 on the Natural Protectorates and/or Law No. 4 of 1994 on Environment, while counting on the other members' consideration for the antiquities and environmental issues, or further external emphasizes by both ministries (i.e. appealing in front of the Prime Minister Council not directly in front of the authority). Basically, the decree-law enforces a strict guard on land use and ownership, and investment shares under exclusive *Veto* rights by the state's national security organizations. Contrarily and positively on the conservation level, the Minister of Defense Decree No. 203 of 2012 prohibits the rent or conduction of any type of behavior in land and real estate located in the nature reserves, and archeological sites and buffer zones. Basically, the decree-law enforces a strict guard on land use and ownership, and investment shares under exclusive *Veto* rights by the state's national security organizations (Official Gazette, 1983a, 1994, 2010, 2012a, 2012b) (UNESCO, 2012).

6.4.1 Review of Law No. 3 of 2010 on the Protection of Antiquities and Law No. 102 of 1983 on the Natural Protectorates

There is no doubt that the golden age of St. Catherine Natural Protectorate took place upon its establishment by Prime Minister Decree No. 940 of 1996 till late 2003 CE (i.e. EU-Commission fund: US\$ 9 million) (Grainger et al., 2008).¹⁶ In 2004 post the EU/EEAA phase, the administrative power was totally transferred to the Egyptian authority of interest under the supervision of Egyptian Environmental Affairs Agency (EEAA). The EEAA receives and manages the financial resources of the natural protectorate; the US\$ 1 million average annual revenue of the introduced admission fee in 2004 CE is directed towards Egypt's protectorates' Special Fund which is stated in Law No. 102 of 1983 (Grainger et al., 2008). As a result, it is a centralized financial resources status (i.e. current circumstances); there are no provisions in

k. Convention on the Protection of the Underwater Cultural Heritage (November 2, 2001): unsigned

l. Convention for the Safeguarding of the Intangible Cultural Heritage (October 17, 2003): ratification on August 3, 2005. In addition to the UNESCO Declaration Concerning the International Destruction of Cultural Heritages on October 17, 2003 (UNESCO, 2012)

¹⁶ Katharina (St. Catherine) Natural Protectorate was declared by Prime Minister Decree No. 613 of 1988 (UNDP, 2002).

the law or executive regulations which guarantee a minimum/maximum sum of financial resources to be reallocated to the protectorate and/or the municipalities of interest in order to fulfill its operations, potential development and conservation-preservation activities.

Accordingly, the protectorate is under-funded, as large sum of its direct revenue is being invested outside the territory of source and direct interest (i.e. St. Catherine Natural Protectorate/Katharina Municipality). Such a poor coordination and under-funded status is also reflected on the execution of Law No. 3 of 2010 on the Protection of Antiquities. Among 76 registered, surveyed or excavated remote archaeological sites in the High Mountains of Sinai Peninsula; in 1970s CE, 55 Byzantine sites were surveyed by Uzi Dahari and Israel Finkelstein, and seven prehistoric sites by Itzhaq Beit-Arieh, in addition to 14 Byzantine and Nabatean sites by others, all during the Israeli occupation phase (Finkelstein et al., 1985) (Dahari, 2000) (Beit-Arieh, 2003);¹⁷ other 54 chronologically unidentified ancient sites were assigned on Tur Sina Map 'TSM' via the survey of Sinai Peninsula Research 2000-2010 CE (Shams, 2011e). Only a handful number of sites—mostly significant monuments at rural/urban areas—are registered by the Egyptian Supreme Council of Antiquities 'SCA' (Atar, 2001) (Gohary et al., 2004). The remote sites are subjected to the relative awareness of local people (i.e. Gebaliya and Awlad Sa'ed Bedouin tribes). Those sites are being identified as ancient structures with almost no distinctive antiquity features for non-specialist—with some exceptions—which differentiate them from the locally built mountainous shelters, leading to the possibility of accidental violation. Such remote sites are subjected to seasonal-temporary/permanent reuse as abandoned settlements (Shams, 2011a) due to the lack of both systematic monitoring activities, either by the protectorate or SCA, and

¹⁷ Prior Six Days War of 5 June 1967 CE 'the full occupation of Sinai Peninsula by the State of Israel (1967-82 CE)', the Arab Republic of Egypt rectified the *Convention for the Protection of Cultural Property in the Event of Armed Conflict* 'Hauge 1954' on August 17, 1955 CE (UNESCO 2012). Post Camp David Peace Treaty between the Arab Republic of Egypt and the State of Israel '1979 CE', in 1994 CE, the excavated Sinaitic antiquities were recovered by the Arab Republic of Egypt from the State of Israel which rectified Hauge Convention on December 3, 1957 (Supreme Council of Antiquities, 1995)

the inexistence of reuse executive plan under the provisions of private property.¹⁸

Although the 800 registered antiquity pieces of Qantra Sharq-Sinaitic—were damaged or stolen during exceptional historic event—January 25, 2011 CE—characterized by security disturbance throughout the Arab Republic of Egypt, it is evident that the poorly armed SCA guards were easily overwhelmed by small better armed groups in different Nile Valley and desert archaeological sites. Only the awareness and direct interest of local communities played a key role in sites protection (Supreme Council of Antiquities, 2011) (Shams 2010, 2011a). It is crucial to highlight the fact that there are potential obstacles to execute Law No. 3 of 2010 by the SCA without putting in action the executive regulations of the neo municipal governance structure as the priority strategy. Regardless the intensive sanctions stated in Law No. 3 of 2010, as long as the administrative power and financial resources stated in the law are centralized in Cairo without integrated and decentralized micro-local/macro-regional eco-cultural based priority strategy(ies), Egypt's natural and cultural landscape legal frame along with the rectified international conventions would be subjected to severe limitations and constraints (Dames & Moore, 1979-85) (Official Gazette, 1983a, 1983b, 1994, 2010) (SEAM 2003-2004) (SSRDP, 2006b) (UNEP, 2006) (Grainger et al., 2008) (Shams, 2011e).

6.5 The relevance of the municipal administrative boundaries

Prior any further discussion about the impact of the current administrative boundaries and Decree-law No. 14 of 2012 on the Integrated Development in Sinai Peninsula, it is must be highlighted that the micro-local/municipal disciplinary committees during phase one would be affiliated to the relevant ministries of interest as well as the macro-regional/governorate directorates in terms of salaries and logistics' costs in the national annual budget, or under a single equivalent proportionally distributed budget of the National Authority

¹⁸ "Ownership of land in Sinai Peninsula—geopolitical security perspective—by locals is still waiting for a resolution by the consecutive Egyptian Governments; only 99 years Usufruct Right 'Leasehold' is enforced on small scale geography." (Shams, 2011e)

for the Development of the Sinai Peninsula. Upon phase two, the financial resources would be allocated on fully decentralized basis:

....but boundaries will only be set in rural areas when the stakes are sufficiently high and growing pressure on natural resources causes conflict (Idelman, 2009).

The High Mountains of Sinai Peninsula follows a topographical feature which roughly overlaps with Katharina Municipality from the administrative point of view, while the municipality falls within the administrative boundaries of St. Catherine Natural Protectorate, South Sinai Governorate. Additionally, there are influential tribal boundaries on ground, being split between all the previously mentioned geographical units. It is a complex governance situation which might have been reviewed at the introduction of this chapter. The alternative bottom-up approach is followed instead of the current top-down one, preserving decentralization as the core target (Idelman, 2009). As a result, St. Catherine Natural Protectorate would represent the Nature Conservation and Waste Management committee within the neo municipal governance structure in all municipalities of interest.

Globally, the municipal administrative boundaries are identified according to the following criteria:

- 1 population: not less than 500 to empower decision making, voting and property assessing base
- 2 property lines: to prohibit any possible splitting
- 3 service areas: intact with community and economies of scale
- 4 geographic features: distinctive natural boundaries (e.g. the High Mountains of Sinai Peninsula)
- 5 road networks: mainly for community serving purposes
- 6 community focus: common services and facilities sharing
- 7 shared economy: socioeconomic and socio-ecological common interest
- 8 financial endowment: sustainable resources for public income (i.e. taxes and other sources for phase two: micro-local financial resources decentralization 'full democratization')
- 9 financial efficiency: exclusion of financial burden areas

- 10 management of growth: inclusion of future development areas
- 11 control of impacts: natural-cultural resources conservation issues (e.g. flashfloods and droughts/dryness; eco-cultural landscape)

Potentially, the High Mountains of Sinai Peninsula reflects the previously mentioned criteria with a crucial pitfall: one of the demographic units—Awlad Sa'aed tribe—coexists with the Gebaliya tribe in Katharina Municipality and sparsely inhabits the southern half of the mountain range, but it does not have any economic rights in Mount Sinai (i.e. central tourist attraction), prohibiting its households from the tourism mainstream income share due to the historically influential tribal boundaries on ground. Such predetermined socio-historical customary rights would face all future attempts in proving equal competitive advantage within the municipal administrative boundaries between its local Bedouin components on one hand and the Nile Valley migrants on the other hand. In the case of the economically potential Mount Sinai, the major right is represented by the entire tribe (i.e. Gebaliya tribe). In other cases where the members of one tribe inhabit the territories of another (i.e. Awlad Sa'aed tribe in the Northern Half of the High Mountains of Sinai Peninsula), minor rights are represented by households and/or clans, in addition to the received support by the entire outside tribe (Prescott, 1978) (Idelman, 2009) (Shams, 2010b, 2011c, 2011e) (South Cowichan, 2012):

....when it came to decentralisation it was unwilling proceed with land reforms that would conflict with rural rationales, given the highly sensitive nature and potential social divisiveness of organizational land rights (Idelman, 2009).

6.6 Summary: the young local generation

In 2012-22 CE 'phase one', both the micro-local/municipal education—partially customized system—and job sectors must sustainably and simultaneously qualify without any major lags. In other words, the willingness of the professionally educated young generation (i.e. Nile Valley or Bedouin Egyptians) in settling Katharina Municipality post 2022 CE counts on two core factors:

- 1 the simultaneous job openings/opportunities
- 2 the lack of key governance roles (i.e. preoccupied positions of specialists and officers).

Accordingly, socioeconomic and customized higher education incentives policy must be enforced in order to combat reverse migration and depopulation. Hence, the disciplinary committees must play a direct role in the evaluation of the socio-ecological and socioeconomic capacity of Katharina Municipality to set feasible and sustainable migration policy.¹⁹ Additionally, in 2012-22 CE, the town of Katharina being the only urban center in the heart of mountainous region of South Sinai would provide an almost uncompetitive opportunity in selling services to other rural-urban communities, acting as the culture and economy hub. Relatively, the future domestic-national subsidizes to the different sectors and international funds would be invested in infrastructure, public services, production facilities, on job capacity-building, landscape conservation-preservation works and short/medium impact research, not mainly on consumption activities (e.g. solar panels vs. gas generators; medicinal plants greenhouses vs. wilderness-based gathering; fieldwork vs. theoretical sessions; reuse of cultural heritage 'ancient irrigation systems' vs. establishment of new facilities).

6.6.1 Future considerations: the Middle East decentralization from Egypt's centralization to Western centralization

Actually, there is a high possibility of the Middle East states' political disintegration upon any attempt to impose absolute decentralization (i.e. provision of legislative powers and total control over regional financial resources) due to its underdeveloped status, reflected in tribal-based lobbying, lack of efficient education and global cross-interest conflicts. A deep understanding for the political debate in the Middle East on the most feasible governance model would lead to a relatively paradoxical aspect which requires further study in theory

¹⁹ Several pilot-studies and scholarly accounts identify the 2017 CE National Plan for Katharina Municipality (i.e. population increase from 4,880 in 1998 CE to 17,378 in 2017 CE, with an estimate of 20,000 in 2020 CE 'individuals') as a radical policy, ignoring the feasible and sustainable capacity of a crucial interrelation between the job sector, ecosystem services and conservation-preservation needs of the eco-cultural landscape (PAMU 2003) (SEAM, 2003-2004) (SSRDP 2006) (Grainger et al., 2008) (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012).

and practice: the demanded degree of decentralization in the Middle East is equivalent to Western Europe degree of centralization (i.e. Republic of Italy or more precisely the French Republic, as the Egypt's legislative system is a modified copy of the French one).

Over the past thirty years, Mubarak's regime had wasted a tremendously valuable opportunity to introduce a scientifically qualified micro-local/municipal young generation who would have relatively and smoothly overshadowed the socio-historical obstacles within the traditional tribal framework—when the socioeconomic needs were not in crisis as in 2011-2013 CE—enabling governance decentralization without facing higher rates of continuity problems (i.e. depopulation, reverse migration, ghost towns and degradation of the eco-cultural landscape).

The dual components of the disciplinary committees (i.e. specialists and officers) would empower the local community and the decision making process by reforming and modernizing the absolute kinship seniority basis. Hence in phase one, the kinship seniority would be still widely represented in the villages' committees, and partially in the executive committee and general assembly. The governance transition during phases one and two has to enable a society transition from the Sinaitic urban homogenous sub-divided (i.e. Bedouin and Nile Valley citizens), or rural homogenous tribal structures (i.e. Bedouin) to homogenous familistic (i.e. inter-marriage). This would be twenty years strategic target. An educated social case, the pioneer Bedouin feminist and business manager Selima El Gably of the Gebaliya tribe proves the viability of education in the dilution—inter-marriage—of the homogenous sub-divided societies.

Due to the low productive ecosystem services in the High Mountains of Sinai Peninsula and the natural-cultural resources' conservation requirements, the services sectors would continue to provide the mainstream job opportunities, as the production sectors (e.g. medicinal plants) would be highly dependent on the households' manpower (i.e. self-employment). As a result, fewer jobs would be available for the Nile Valley migrants to Katharina Municipality, with exception to the governmental sector (i.e. disciplinary committees' specialists) and the outsourcing contracts, especially under the current socio-historical customary rights.

6.2 Conclusion

There is no doubt that the revolutions of the Middle East in 2011-2013 CE—what so called the Arab Spring—shed the light once again on the implementation obstacles of sustainable development in practice. Centralization, sub-optimization, and trans-border/crisscross culture have been extensively discussed over decades with limited progress in the developing countries, accounting to several domestic (e.g. mismanagement, corruption, inefficient consultancy role, traditional tribal system ‘kinship seniority basis’, social homogeneity subdivisions, education, productivity and national security) and external factors (e.g. cross political and economic interest). The eco-cultural landscape could not be regarded apart of the efficiency of entire governance structure with higher weight given to the micro-local/municipal (i.e. tactic level), requiring a multilevel monitoring system. Historically and strategically, the complex context of Sinai Peninsula enforced legislative and administrative constraints (e.g. land use and ownership) on the micro-local/municipal and macro-regional/governorate levels, centralizing the planning and decision making process in Cairo and subjecting it to security-based *Veto*. Landscape is the first to pay a high price in terms of conservation and preservation along with the sustainability and decrease theories.

Accordingly, the neo municipal governance structure ‘organizational blueprint’ is introduced as a dual phase alternative. It is an economically feasible and organizationally crucial socio-ecological and socioeconomic decentralized governance foundation. Gradually, the neo governance structure would stabilize over phase one (i.e. semi-decentralization ‘five-ten years’: education and socioeconomic leverage phase), reaching its maturity in phase two (i.e. micro-local financial resources decentralization ‘full democratization’). In other words, phase one is the first step on developing the traditional Middle East governance centralization similar to the High Mountains of Sinai Peninsula–Katharina Municipality—and other Sinaitic and nationwide municipalities.

7. Heritage-based land use patterns in the High Mountains of Sinai Peninsula and the Alps: a neo socio-ecological perspective

7.1 Background

In late 19th-20th century CE, globally and consecutively, the world's mountainous communities established permanent rural-urban settlements in the low-elevated valleys and plains (i.e. economic-based migration patterns); relatively abandoning the traditional highland patterns and establishing modern socioeconomically feasible ones (i.e. mass urbanization process). In the light of the current global economic crisis 'transition phase' and the climate change impact on the environmental capacity of the mountainous natural resources, there is a necessity to emphasize the inter-impacting socio-ecological relation on the interchanging land use patterns under different capacities, towards the preservation of mountainous landscapes. This chapter presents a neo socio-ecological perspective; it is a timeline comparative analysis in practice between the High Mountains of Sinai Peninsula (i.e. UNESCO World Heritage Site 'WHS' no. 954) and Val Venosta/Vinschgau 'Alto Adige/Südtirol' province, focusing on the interconnected key aspects of the eco-cultural/agro-tourism and husbandry economical activities (i.e. crops-fodder cultivation, livestock and herbs collection-production). By identifying the dynamics of the heritage-based land use patterns of two climatologically different mountain ranges (i.e. semi-arid 'Middle East/rainfall: 60mm/year' and arid 'Central Alpine/rainfall: 525mm/year'), characterized by sectoral depletion of the wild plant species of potential socioeconomic functions, it is feasible to address with relatively high accuracy the socio-ecological option(s) of mountainous communities on nano-micro levels.

7.2 Environmental setting

Globally, there is no doubt that the major human cyclic 'internal' and/or permanent highland outflow migration is due to socioeconomic causes, subjected to natural-cyclic Climate Change not human-caused 'anthropogenic' one—with exception to the irregular long drought periods at some specific regions (e.g. Horn of African)—under a

relatively constant environmental capacity and changing socio-ecological relation (i.e. land use pattern). On the way of establishing a solid argument about the rise, consolidation and decline of the economic-based highland migration patterns, the climate change factor must be eliminated in practice, concurrently with the analysis of an extensive comparative timeline for the socioeconomic transitions. Accordingly, two climatologically different mountain ranges are chosen to undergo the comparative analysis, representing two different environmental capacities:

- 1 the High Mountains of Sinai Peninsula (i.e. UNESCO World Heritage Site 'WHS' no. 954; semi-arid 'Middle East/rainfall: 60mm/year')
- 2 Val Venosta/Vinschgau 'Alto Adige/Südtirol' province (i.e. arid 'Central Alpine/rainfall: 525mm/year') (ICOMOS, 2002) (Grainger, 2003) (Tapeiner et al., 2008) (Fig. 67-70) (Table 38 & 39)

Since late 4th millennium BCE, both regions are undergoing a steady warming trend along with an argumentative accelerative industrialization causes since the 2nd half of 19th-21st centuries CE which is out of scope of this paper. Relatively, the natural-cyclic climate factor is set as a constant, identifying a certain fixed level of available natural resources (i.e. environmental capacity).

The High Mountains of Sinai Peninsula:

Lies in the arid North African belt and is characterized by a Saharan-Mediterranean climate (Grainger, 2003).

(i.e. geology: magmatic in origin, composed of plutonic and volcanic rocks 'Precambrian Era 500-1,000 million years ago'; elevation range: 950-2642m ASL; area: max. length 42km and max. width 17.5km; mean max. and min. temperature: 36°C 'August' and -7.8°C 'February' respectively; mean annual rainfall: 60mm/year, sporadic 'October-May'; orographic snow precipitation: 300mm/year; relative humidity: max. 50%; actual total evaporation 4071mm/year/open water surface; phytogeographic regions: Saharo-Arabian 'desert vegetation below 1300m ASL' and Irano-Turanian 'steppe vegetation above 1600m ASL') (Perevolotsky, 1981) (Grainger, 2003); on the other hand, Val Venosta/Vinschgau 'Alto Adige/Südtirol' is characterized by a Central Alpine-Arid climate (i.e. geology: crystalline formations; elevation range: 556-3905m ASL, study-area: 922-3739m ASL; area: 7,399/1,442

Heritage-based land use pattern

square kilometers; mean max. and min. temperature: 36°C 'July-August' and -16°C 'December-February' respectively; mean annual precipitation 'rain-fall/snow': 525mm/year, 40 and 12%, summer and winter respectively; evaporation rate: 180mm/year 'July-August'; phytogeographic regions: Inner Alps) (Tappeiner et al., 2008) (Fig. 71).

Table 38 Socioeconomic timeline of South Tyrol-Sudtiroi/Alto Adige 'Theme: Farmsteads = Maps' (Cole et al., 1999; other references specified)

Date	Socioeconomic Condition
Climate: last major Alpine glaciers retreat in 15,000-12,000 BCE → warm (South Tyrol Museum of Archeology, 2012)	
Climate: glaciers retreat + tree line upward expansion	
Mesolithic [Middle Stone Age] (9,000-5,500 BCE) (South Tyrol Museum of Archeology, 2012)	<p><i>Huntsmen clan</i> <i>'Lowland pattern'</i> (winter: nearby springs, streams and lakes; shelter: rock overhangs, simple dugouts, and tents)</p> <p>- <u>Hunters</u>: red deer, ibex and chamois (i.e. summer; highland pattern)</p> <p>- <u>Fishing</u></p> <p>- <u>Gatherers</u></p> <p>- <u>Migration</u>: clans movement from Alpine foothills to central Alps</p>
Pottery Neolithic [New Stone Age] (5,500-3,500 BCE) (South Tyrol Museum of Archeology, 2012)	<p><i>Gaban pottery culture in Southern Alps</i> <i>Sedentary villages and early farmsteads</i> <i>'Lowland pattern'</i> (stone cists burials, large stone burial chambers, standing stones, stone rows, stone circles, and extensive rock-cut tombs)</p> <p>- <u>Cultivation of crops</u>: lowland pattern; barley, emmer wheat, einkorn, peas, and lentils</p> <p>- <u>Herding animals</u>: lowland and highland pattern; sheep, goats, pigs, cattle, and dogs</p> <p>- <u>Hunting</u>: highland</p> <p>- <u>Gathering</u></p>
Climate: steady warming trend (glaciers retreat + tree line upward expansion) (Fig. 72)	

Human Occupation Development

Chalcolithic [Copper Age]
(3,500-2,300 BCE)
 (Cole et al., 1999) (South Tyrol
 Museum of Archeology, 2012)

- Flamboyant culture*
- Agriculture: lowland
 - Herding: lowland
 - Hunting: **highland**
 - Gathering
 - Mining: copper
 - Trade: copper and copper objects

Bronze Age
(2,300-1,000 BCE)
 (Cole et al., 1999) (South Tyrol
 Museum of Archeology, 2012)

- Laugen-Melaun culture*
Urnfield culture
*Small bands 'husbandry/agro-pastoral/
 mixed-agriculture'*
(crimination and burials in urns)
- Agriculture: lowland
 - Herding: lowland
 - Hunting: **highland**
 - Gathering
 - Mining: bronze and copper
 - Trade: bronze, copper and tin, ores and objects (i.e. jewelry and armors)
 - Transportation: salt and metal works on horse-drawn vehicles

Prehistoric-11th century CE+
 (Kompass, 2012)

- Fortification: Mayenburg at Foiana/Vollan (Resia/Reschen Pass and Moso/Moos Pass)*; Niclara at Cortaccia sulla Strada del Vino/Kurtatsch (Adige)***

Prehistoric-1203 CE+
 (Kompass, 2012)

- Fortification: Castelfeder at Montagna/Montan (Adige)***

Prehistoric-1220 CE+
 (Kompass, 2012)

- Fortification: Boymont at Appiano sulla Strada del Vino/Eppan 'Missiano' (Reschen/Resia Pass)***

220 BCE
Iron Age (1,000-15 BCE)
Roman Period (15 BCE-400 CE)
 (Cole et al., 1999) (South Tyrol
 Museum of Archeology, 2012)

- Political consolidation/administration: Rhaeto-Roman (i.e. earlier Fritzens-Sanzano culture in 550 BCE; later Celts influence in 440 BCE) cultural influence and control over the lowland valleys of South Tyrol/Sudtiroil (Alto Adige) and Romance Tyrol (Trentino/Trento), leading to the central-east Alpine cisalpine-transalpine Passes (i.e. Brennero/Brenner and Reschen/Resia)
- Population: mixed lowland population (i.e. Romanization); traditional upland

Heritage-based land use pattern

	<p>populations.</p> <p>- <u>Transportation</u>: spices, oil, coral, ivory, and fine bronze via Brennero/Brenner Pass as Roman avenue (i.e. Rhaeti guides and porters)</p> <p><u>Note</u>: grapevines in 500 BCE</p>
<p>5th century CE <i>Late Antique Period-Early Middle Ages (400-1,000 CE)</i></p>	<p>- <u>Political consolidation/administration</u>: Alemanni/Bavarian (Germanic) control over the lowland valleys of Tirol (i.e. South Tyrol/Sudtirol and North Tyrol/Noord Tirol)</p>
<p>6th-11th centuries CE</p>	<p style="text-align: center;"><i>Tirol economy</i></p> <p>- <u>Feudalism/subsistence</u>: land owners/ Nobels and peasants (i.e. rents-based system)</p>
<p>7th-8th centuries CE</p>	<p>- <u>Population</u>: Alemanni (German) in cisalpine</p>
<p>945 CE (Kompass, 2012)</p>	<p>- <u>Fortification</u>: Firmiano/Formicaria at Ponte Adige/Sigmundskron (Brennero/Brenner and Reschen/Resia junction)***</p>
<p>990 CE (Kompass, 2012)</p>	<p>- <u>Fortification</u>: Säben at Chiusa/Klausen (Brennero/Brenner Pass)**</p> <p>- <u>Fortification</u>: emergence of the Nobel families' castles</p> <p>- <u>Migration</u>: establishment of the permanent highland patterns (i.e. size compensation/less productive lands)</p>
<p>1000 CE (Kompass, 2012)</p>	<p style="text-align: center;"><i>Tirol economy</i></p> <p style="text-align: center;"><i>Relative conversion of forest and pastures to plowlands and meadows</i></p> <p>- <u>Mountainous agriculture</u>: low and highland patterns</p> <p>- <u>Herding</u>: low and highland patterns</p> <p>Note: higher weight for crop fields in lowlands and livestock in highlands</p>
<p>11th century CE (Kompass, 2012)</p>	<p>- <u>Fortification</u>: Leone/Leonburg at Lana/Lana di Sotto (Resia/Reschen Pass)*</p>
<p>11th-18th centuries CE</p>	<p>- <u>Population</u>: 5-9 individuals/household-farmstead</p>

Human Occupation Development

11th-12th centuries CE

1020 CE
(Kompass, 2012)

1053 (13th century?) CE
(Kompass, 2012)

1077-82 CE
(Kompass, 2012)

12th century CE
(Kompass, 2012)

- Migration: Alemanni (German)/Bavarian expansion on the low and **highland** patterns in Romance Tyrol (Trentino/Trento)

- Fortification: Sonnenburg 'Badia' at San Lorenzo di Sebato/St. Lorenzen by Nobles of Lurn (Valle Pusteria/Pustertal)*****

- Fortification: Haderburg at Salorno/Salurn (Adige)**

- Fortification: Labers at Merano/Meran by Ulrich von Laubers (Resia/Reschen Pass and Moso/Moos Pass)

- Fortification: Goyen/Gaiano at Merano/Meran (Resia/Reschen Pass and Moso/Moos Pass)*; Kehlburg at Gias (Valle Aurina/Ahrntal); Engelsburg at Varna/Vahrn (Brennero/Brenner Pass); Mühlbacher Klause at Rio di Pusteria/Mühlbach (Valle Pusteria/Pustertal); Michelsburg at San Lorenzo di Sebato/St. Lorenzen (Valle Pusteria/Pustertal); Welsberg at Monguelfo-Tesido/Welsberg (Valle Pusteria/Pustertal); Helfmirtgott at Tübre/Taufers im Münstertal (off Resia/Reschen Pass); Caldifff/Kaldifff at Egna/Neumarkt by Lords of Enna (Adige)**; Roveretoat Castelrotto/Kastelruth (Brennero/Brenner Pass)*****

- Law: Tyrolese legislations on impartible inheritance of land by the successors of the peasants

- Political consolidation/administration: independent peasants control over the production and harvest deposition under a feudal/rent-based system

Medieval Tirol economical transition phase I

*Schwaige holdings 'households/farmsteads'
('husbandry/agro-pastoralism/mixed-agriculture')*

Heritage-based land use pattern

	<ul style="list-style-type: none"> - <u>Mining</u>: copper - <u>Mountainous agriculture</u>: low and highland patterns (i.e. local consumption) - <u>Herdin</u>g: low and highland patterns (i.e. local consumption) - <u>Weaving?</u> Equivalent to the later handicrafts (i.e. local consumption) - <u>Charcoal/Firewood</u>: low and highland patterns (i.e. local consumption) - <u>Hunting</u>: low and highland patterns (i.e. local consumption)
1100 CE (Kompass, 2012)	- <u>Fortification</u> : Reifenstein ‘Tasso’ at Campo di Trens/Freienfeld Brennero/Brenner Pass)**; Stock ‘Ottone’ in Luttach at Villa Ottone (Valle Aurina/Ahrntal)*****
1125-1130 CE (Kompass, 2012)	- <u>Fortification</u> : Hocheppan at Appiano sulla Strada del Vino/Eppan ‘Missiano’ (Resia/Reschen Pass)**
1136 CE (Kompass, 2012)	- <u>Fortification</u> : Taufers/Trostburg at Campo Tures/Sand in Taufers (Valle Aurina/Ahrntal)**
1140 CE (Kompass, 2012)	- <u>Fortification</u> : Tirol at Tirol/Tirol by the Counts of Tyrol (Resia/Reschen Pass)*; Rodeneck at Rodengo/Rodeneck by Friedrich von Rodank (Brennero/Brenner Pass and Valle Pusteria/Pustertal)** (Fig. 73)
1146 CE (Kompass, 2012)	- <u>Fortification</u> : Kastellatz at Malles/Mals (Resia/Reschen Pass)**
1150 CE (Kompass, 2012)	- <u>Fortification</u> : Uttenheim at Gias (Valle Aurina/Ahrntal)**
Second half of 12 th century CE (Kompass, 2012)	- <u>Fortification</u> : Velthurns at Velturmo/Feldthurns (Brennero/Brenner Pass)**
1155-1164 CE (Kompass, 2012)	- <u>Fortification</u> : Schöneck at Falzes/Pfalzen by Counts of Tyrol and Engelmar von Villanders (Valle Pusteria/

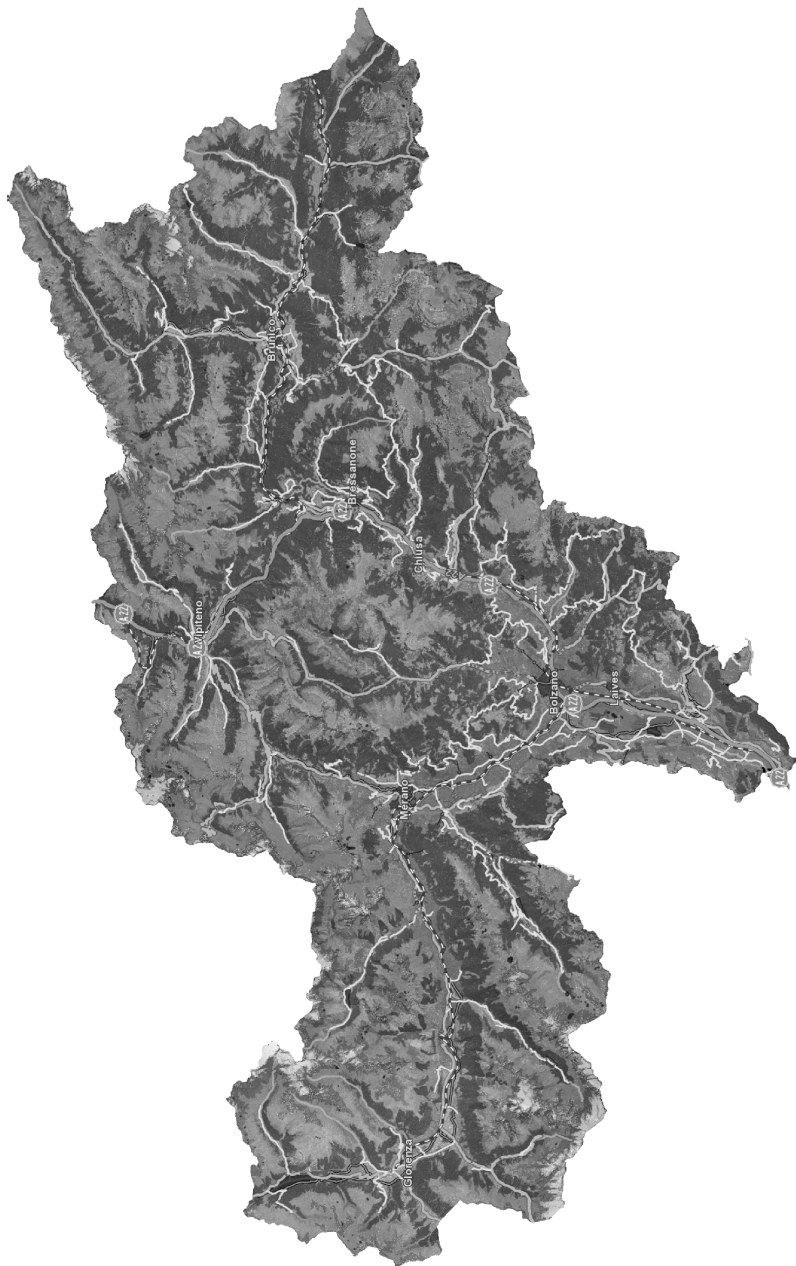


Figure 67 Alto Adige/Südtirol province (base map: Orthofoto 2011 CE): Product of the Autonomous Province of Bozen/Bolzano - South Tyrol

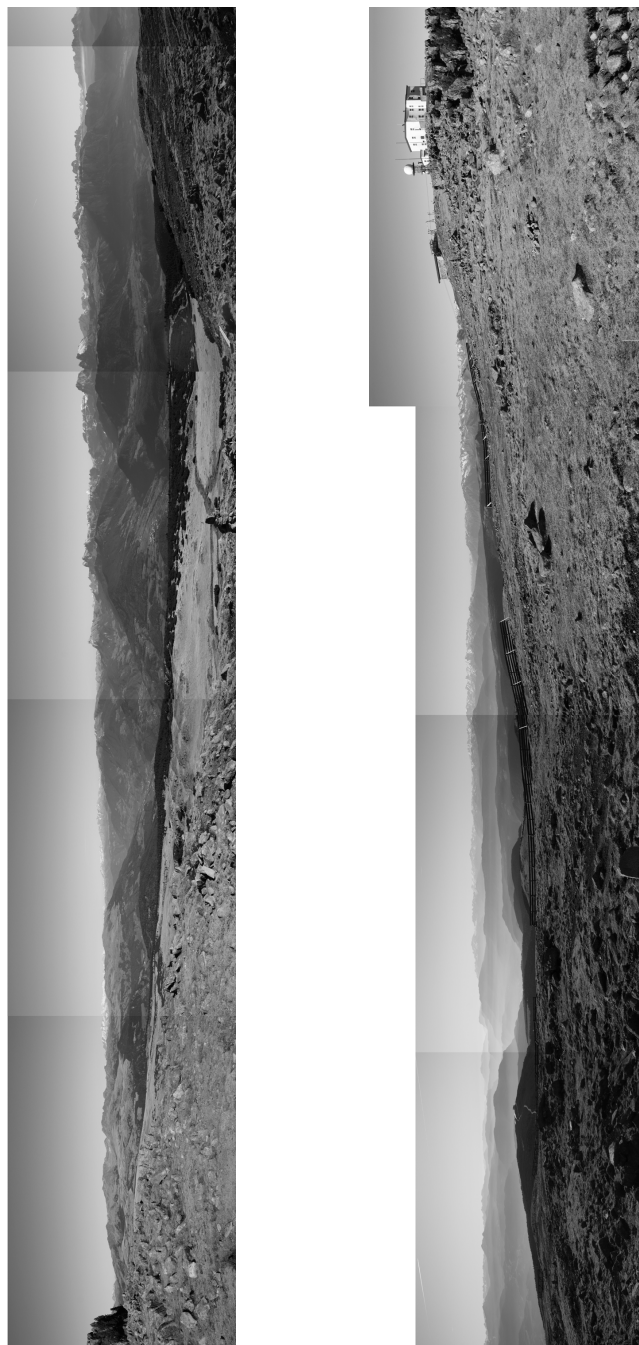


Figure 68a Corno del Renon/Rittner Horn panoramic view 2260m ASL 'summit's southeast position' (Renon/Ritten, 'Alto Adige/Südtirol' province) - November 17, 2011: SinaiAlps Project 2011-2012 CE

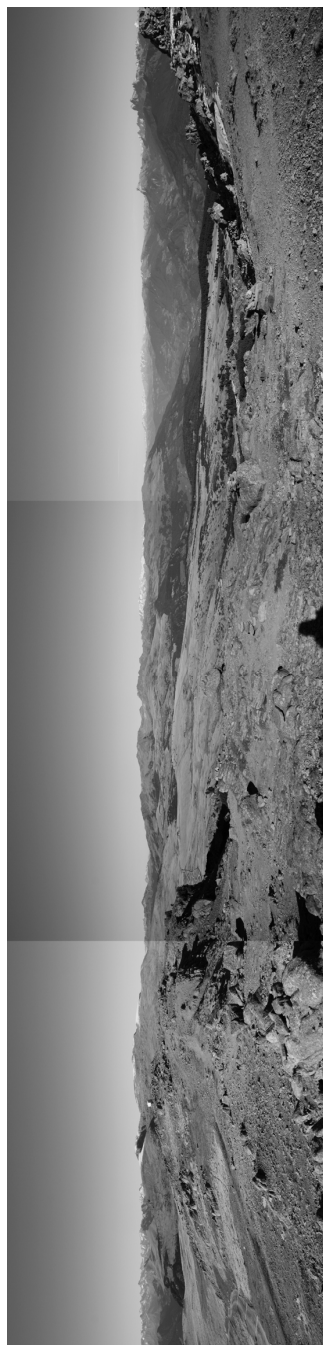


Figure 68b Corno del Renon/Rittner Horn panoramic view 2260m ASL 'summit's northwest position' (Renon/Ritten, 'Alto Adige/Südtirol' province) – November 17, 2011: SinaiAlps Project 2011-2012 CE

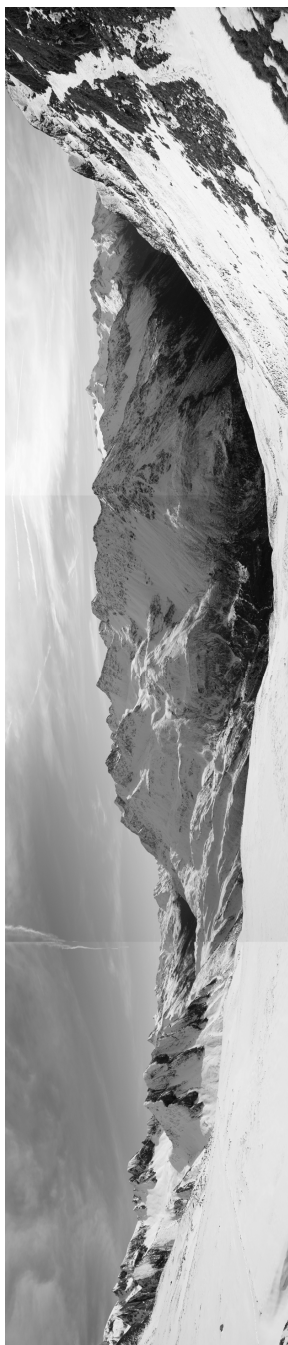


Figure 69 Ochslenlenke panoramic view 2585m ASL, Valle dei Dossi/Knuttental (Val Pusteria/Pustertal, 'Alto Adige/Südtirol' province) - October 28, 2011: SinaiAlps Project 2011-2012 CE

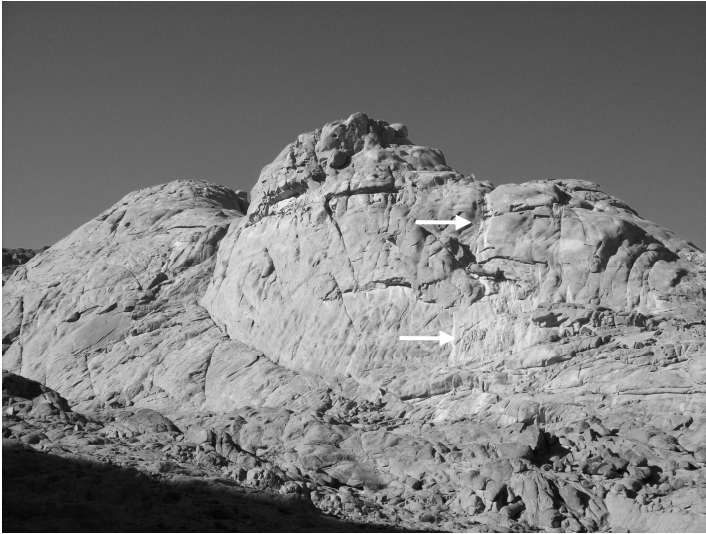


(a - 2010 CE)



(b - 2011 CE)

Figure 70 (a) Farsh Umm Sila 2300 m ASL [G. Katharina 2642 m ASL] (High Mountains of Sinai Peninsula) – August 15, 2010: Sinai Peninsula Research 2000-2010 CE; (b) Val di Mazia/Matscher upstream area ‘Rio Saldura’ 2250m ASL, Bei der Klamm [Garten; Fernerpleisen; Matscher Joch 3185m ASL] (Val Venosta/Vinschgau, ‘Alto Adige/Südtirol’ province) – November 10, 2011: SinaiAlps Project 2011-2012 CE



(a - 2010 CE)



(b - 2011 CE)

Figure 71 (a) W. Zuweitin upstream area 1950m ASL, G. Mahshur dry-seasonal waterfall (High Mountains of Sinai Peninsula) – June 19, 2009: Sinai Peninsula Research 2000-2010 CE; (b) Val di Mazia/Matscher upstream area ‘Boden/Rio Saldura’ 2250m ASL, Samarten permanent waterfall (Val Venosta/Vinschgau, ‘Alto Adige/Südtirol’ province) – October 18, 2011: SinaiAlps Project 2011-2012 CE



(a - 2011 CE)



(b - 2011 CE)

Figure 72 (a & b) 150+ years old Hintereisferner glacier rock grooves; Val di Mazia/Matscher upstream area 'Rio Saldura' 2250m ASL, Bei der Klamm (Val Venosta/Vinschgau, 'Alto Adige/Südtirol' province) - November 10, 2011: SinaiAlps Project 2011-2012 CE



(a - 2012 CE)



(b - 2011 CE)

Figure 73 (a) Tirol fortress-upper-by the Counts of Tyrol in 1140 CE ‘600m ASL’ on the route of Resia/Reschen Pass, Knappenloch [Etsch Valley; Lagundo/Algund area 350m ASL; Cigot/Tschigot 2998m ASL and Cima di Tel/Zielspitz 3009m ASL] (Merano/Meran, ‘Alto Adige/Südtirol’ province) – March 13, 2012; (b) Coira/Churburg fortress by the bishops of Chur in 1253 CE ‘999m ASL’ on the route of Resia/Reschen Pass, Sluderno/Schluderns [Cima di Tella/Tellakopf 2525m ASL and Mornpiccio/Muntpitschen 3162m ASL] (Val Venosta/Vinschgau, ‘Alto Adige/Südtirol’ province) – November 19, 2011: SinaiAlps Project 2011-2012 CE

Human Occupation Development

	Pustertal)**
1158-1160 CE (Kompass, 2012)	- <u>Fortification</u> : Grifo/Greifenstein 'Poro/Pork' at San Genesio/Jenesien (Brennero/Brenner and Reschen/Resia junction)**
1164 (1189?) CE (Kompass, 2012)	- <u>Fortification</u> : Eschenlohe at San Pancrazio/St. Pankraz by the Counts of Tyrol (off Resia/Reschen Pass)*
1170 CE (Kompass, 2012)	- <u>Fortification</u> : Fingeller at Sarentino/Sarntal (Brennero/Brenner Pass)**
1172 CE (Kompass, 2012)	- <u>Fortification</u> : Enna at Montagna/Montan by Enn Nobel family (Adige)**
1179 CE (Kompass, 2012)	- <u>Fortification</u> : Brandis at Lana/Lana di Sotto (Resia/Reschen Pass)*
1184 CE	- <u>Transportation</u> : crusaders avenue to the Holy Land
1186 CE (Kompass, 2012)	- <u>Fortification</u> : Castelvechio at Siusi allo Sciliar/Seis am Schlern by Eckhard of Villandro (East)*****
1189 CE (Kompass, 2012)	- <u>Fortification</u> : Völseck at Tires/Tiers (East)**
1194 CE (Kompass, 2012)	- <u>Fortification</u> : Casaccia/Casatsch 'Pfeffersburg' at Nalles/Nals by Ulrich Rufus, Marquard, Hartwig of Tesimo, and Heinrich and Friedrich von Pitzol (Resia/Reschen Pass)*; Guardia 'Warth' at San Paolo/St. Pauls by Earl of Appiano (Adige); Mareccio/Maretsch at Bolzano/Bozen by Berthold von Maretsch (Brennero/Brenner and Reschen/Resia junction)***
1196 CE (Kompass, 2012)	- <u>Fortification</u> : Trostburg at Ponte Gardena/Waidbruck (Brennero/Brenner Pass)**
Late 12th century CE (Kompass, 2012)	- <u>Fortification</u> : Steinegg at Cornedo all'Isarco/Karneid (Brennero/Brenner Pass)**
13th century CE	- <u>Fortification</u> : Vorst at Lagundo/Algund

Heritage-based land use pattern

(Kompass, 2012)

(Resia/Reschen Pass); Bavaro 'Payersberg' at Sirmiano di Sotto by Counts von Payr (Resia/Reschen Pass); Stachlburg at Partschins/Parcines (Resia/Reschen Pass); San Zeno/Zenoburg at Merano/Meran by Meinhard II (Resia/Reschen Pass and Moso/Moos Pass); Aura 'Auer' at Tirol/Tirol (Resia/Reschen Pass); Fahlburg at Prissiano 'Nalles/Nals' by (Resia/Reschen Pass); Monteleone 'Lebenberg' at Cermes/Tscherms by Lords of Marlengo (Resia/Reschen Pass)*; Katzenstein 'Gatto' at Merano/Meran (Resia/Reschen Pass); Planta at Merano/Meran (Resia/Reschen Pass); Saltaus at San Martino in Passiria/St. Martin in Passeier (Moso/Moos Pass); Kematen 'Tures?' at Campo Tures/Sand in Taufers (Valle Aurina/Ahrntal); Kastelruth at Castelrotto/Kastelruth (Brennero/Brenner Pass); Stetteneck Ortisei/St. Ulrich in Gröden by Nobels of Stetteneck (East); Thurn at Nova Ponente/Deutschnofen (East); Gravetsch at Villandro/Villanders (Brennero/Brenner Pass); Sprechenstein 'Pietra' at Campo di Trens/Freienfeld (Brennero/Brenner Pass); Wolfsturn at Racines/Ratschings (Brennero/Brenner Pass and Moso/Moos Pass); Kastelbell at Kastelbell/Kastelbell-Tschars (Resia/Reschen Pass); Auer at Ora/Auer (Adige)**; Rafenstein at San Genesio/Jenesien by Bishop of Trento Friedrich von Wangern (Brennero/Brenner and Reschen/Resia junction); Sant'Antonio 'Karnol/Gscheibter Turm' at Bolzano/Bozen (Brennero/Brenner and Reschen/Resia junction)***; Freudenstein at Appiano sulla Strada del Vino/Eppan 'S. Michele' (Adige)****; Thurn at Valle di Casies/Gsies (Valle

(Kompass, 2012)

13th -14th centuries CE
(Kompass, 2012)

Aurina/Ahrntal?)******

- Fortification: Karneid at Cornedo all'Isarco/Karneid (Brennero/Brenner Pass); Trens at Cornedo all'Isarco/Karneid (Brennero/Brenner Pass); Ehrenburg at Chienes/Kiens (Valle Pusteria/Pustertal)**

- Fortification: Giovo 'Jaufenburg' at San Leonardo 'Passiria/Passeiertal' (Moso/Moos Pass)*

- Population: rise of Tyrolese towns (i.e. lowland patterns)

Medieval Tirol economical transition
phase II-A

Main economy (rise)
'Lowland pattern'

- Transportation: lowland economic activity between southern Germany and northern Italy; Venice/Verona north-south trade (i.e. linen, wool, furs, pigments, iron tools and precious metals) and south-north trade (i.e. cottons, silks, spices and glass)

- Trade accommodation facility: lowland taverns and hostleries for merchants and travelers as an early example of the later tourism accommodation facilities

- Wage labor: smiths, carters and wainwrights in the rising lowland Tyrolese towns (Fig. 74)

Supportive economy
*'Low and **high land** patterns' (rise)*
(Inflation/fixed rents impact)

- Mountainous husbandry: expansion in the low and **highland** patterns as a response to the increasing population and its food requirements (i.e. early pilot-commercialization; local-regional consumption); seasonal short-range local cycle (Fig. 75-79)

- Weaving? equivalent to the later

Heritage-based land use pattern

	<p>handicrafts (i.e. local consumption) - <u>Charcoal/Firewood</u>: low and highland patterns (i.e. local consumption) (Fig. 80) - <u>Hunting</u>: low and highland patterns (i.e. local consumption)</p>
<p>1200 CE (Kompass, 2012)</p>	<p>- <u>Fortification</u>: Salego/Salegg at Castelrotto/Kastelruth by Lords of Salego (Brennero/Brenner Pass); Leuchtenburg at Vadena/Pfatten (Adige)**; Flavon 'Haselburg' at Bolzano/Bozen by Lords of Haselberg (Brennero/Brenner and Reschen/Resia junction)***; Rasun Nuova at Rasun Anterselva/Rasen-Antholz 'Rasun di Sopra' by Lords of Rasun (Valle Pusteria/Pustertal)*****</p>
<p>1217 CE (Kompass, 2012)</p>	<p>- <u>Fortification</u>: Tarantsberg/Taranto 'Dornsberg' at Plaus/Plaus-Naturns /Naturno (Resia/Reschen Pass)*</p>
<p>1220 CE (Kompass, 2012)</p>	<p>- <u>Fortification</u>: Neuhaus 'Maultasch' at Terlano/Terlan (1228?) (Resia/Reschen Pass); Neurasen 'Rasun Vecchia' at Rasun Anterselva/Rasen-Antholz by Lords of Rasun (Valle Pusteria/Pustertal)**; Castelforte/Festenstein at Andriano/Andrian (Resia/Reschen Pass)***</p>
<p>1222 CE (Kompass, 2012)</p>	<p>- <u>Fortification</u>: Zwingenberg at Prissiano 'Nalles/Nals' by Counts of Zwingenberg (Resia/Reschen Pass)*</p>
<p>1225 CE (Kompass, 2012)</p>	<p>- <u>Fortification</u>: Turmhof-Tiefenbrunner at Niclara (Adige)***</p>
<p>1227 CE (Kompass, 2012)</p>	<p>- <u>Fortification</u>: Pflanzenstein at Merano/Meran by (Resia/Reschen Pass); Rametz at Merano/Meran by (Resia/ Reschen Pass); Lajen at Laion/ Lajen (Brennero/Brenner)**</p>
<p>1229 CE (Kompass, 2012)</p>	<p>- <u>Fortification</u>: Sant'Erasmo at Prissiano 'Nalles/Nals' by Wehrburg (Resia/Reschen Pass)*</p>

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1230 CE (Kompass, 2012)	- <u>Fortification</u> : Thurn/Tor at San Martino at Badia/St. Martin in Thurn (East)**; Laimburg at Vadena/Pfatten by Lords of Laimburg (1269?) (Adige)***
----- (Kompass, 2012)	- <u>Fortification</u> : Wiesenegg at Dobbiaco/Toblach (East)**
1231 CE (Kompass, 2012)	- <u>Fortification</u> : Braunsberg at Lana/Lana di Sotto 'Gaulschlucht' by Ulrich von Braunsberg (Resia/Reschen Pass)*
1236 CE (Kompass, 2012)	- <u>Fortification</u> : Corba/Korb at Appiano sulla Strada del Vino/Eppan 'Missiano' (Reschen/Resia Pass)***
1237 CE (Kompass, 2012)	- <u>Fortification</u> : Andrian at Bolzano/Bozen (Brennero/Brenner and Reschen/Resia junction)? Roncolo/Runkelstein at Bolzano/Bozen by Lords of Wangen (Brennero/Brenner and Reschen/Resia junction); Wolkenstein 'Presule/Prosels' at Selva di Val Gardena/Wolkenstein in Gröden by Oswald von Wolkenstein (1279?) (East)**
1240-1245 CE (Kompass, 2012)	- <u>Fortification</u> : Neuhaus 'Casanova' at Gias by Lords of Tures (Valle Aurina/Ahrntal)**
1240-1250 CE (Kompass, 2012)	- <u>Fortification</u> : Turmbach at Appiano sulla Strada del Vino/Eppan (Adige)**
1241 CE (Kompass, 2012)	- <u>Fortification</u> : Fontana 'Brunnenburg' at Tirol/Tirol (Resia/Reschen Pass)*
1244 CE (Kompass, 2012)	- <u>Fortification</u> : Katzenzungen at Tesimo/Tisens by Henricus de Cazenunge (Resia/Reschen Pass)*
Mid 13th century CE (Kompass, 2012)	- <u>Fortification</u> : Naturno at Naturno/Naturns by Oswald von Naturns (Resia/Reschen Pass)*; Aichberg and Paschbach at Appiano sulla Strada del Vino/Eppan 'S. Michele' (Adige)***
Second half of 13th century CE (Kompass, 2012)	- <u>Fortification</u> : Straßberg at Vipiteno/Sterzing (Brennero/Brenner)**
1250 CE (Kompass, 2012)	- <u>Fortification</u> : Kroell/Kröllturm at

Heritage-based land use pattern

	Gargazzone/Gargazon (Resia/Reschen Pass)*; Moos-Schulthaus 'Palù' at Appiano sulla Strada del Vino/Eppan (1270?) (Adige)**
1251-1288 CE (Kompass, 2012)	- <u>Fortification</u> : Bruneck at Brunico/Bruneck by Bruno von Kirchberg the bishop of Bressanone (Valle Pusteria/Pustertal)**
1253 CE (Kompass, 2012)	- <u>Fortification</u> : Churburg 'Coira' at Sluderno/Schluderns by the bishops of Chur (Resia/Reschen Pass)**
1254 CE	- <u>Political consolidation/administration</u> : unification of Tirol (i.e. low and highland patterns) under the counts 'Nobel families' (i.e. North Tyrol/Noord Tirol, South Tyrol/Sudtirol, East Tyrol/Osttirol and Romance Tyrol 'Trentino/Trento')
1259 CE (Kompass, 2012)	- <u>Fortification</u> : Klebenstein at Bolzano/Bozen (Brennero/Brenner and Reschen/Resia junction); Entiklar at Cortaccia sulla Strada del Vino/Kurtatsch (Adige)**
1268 CE (Kompass, 2012)	- <u>Fortification</u> : Campan at Caldaro Sulla Strada del Vino/Kaltern by Concius von Campan 'Villa di Mezzo' (Adige)***
1273 CE (Kompass, 2012)	- <u>Fortification</u> : Schnals at Senales/Schnals (Reschen/Resia)**
1276 CE (Kompass, 2012)	- <u>Fortification</u> : Thurm Platzleid 'Thurnstein' at Lagundo/Algund by Meinhard von Tirol (Resia/Reschen Pass)*
1272-1282 CE (Kompass, 2012)	- <u>Fortification</u> : Fürstenburg at Malles/Mals (Resia/Reschen Pass)**
1278 CE (Kompass, 2012)	- <u>Fortification</u> : Juval at Naturns/Naturno by Hugo von Montalban (Resia/Reschen Pass)*
1280 CE (Kompass, 2012)	- <u>Fortification</u> : Wolfsthurn by Lords of Andriano at Andriano/Andrian (Resia/Reschen Pass)***
1281 CE	- <u>Fortification</u> : Eyrsburg at Lasa/Laas

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(Kompass, 2012)	(Resia/Reschen Pass)**
1284 CE (Kompass, 2012)	- <u>Fortification</u> : Riffian at Rifiano/Riffian (Moso/Moos Pass); Chiaro at Caldaro Sulla Strada del Vino/Kaltern by Lords of Rottenburg (Adige)**
1285 CE (Kompass, 2012)	- <u>Fortification</u> : Maur at Merano/Meran by Peter Delugan (Resia/Reschen Pass)**
1286 CE (Kompass, 2012)	- <u>Fortification</u> : Schwanburg 'Hans in der Gaul' at Nalles/Nals (Resia/Reschen Pass)*
1289 CE (Kompass, 2012)	- <u>Fortification</u> : Postal at Burgstall /Postal (Resia/Reschen Pass)*
1290 CE (Kompass, 2012)	- <u>Fortification</u> : Kematen at Val di Vizze/Pfitsch (Brennero/Brenner Pass)**
1292 CE (Kompass, 2012)	- <u>Fortification</u> : Unterfennberg at Magré sulla Strada del Vino/Margreid (Adige)**
Late 13th century CE (Kompass, 2012)	- <u>Fortification</u> : Lichtenberg at Prato allo Stelvio/Prad am Stilfserjoch (Stelvio/Stilfser Joch Pass)**
14th century CE (Kompass, 2012)	- <u>Fortification</u> : Mairhof zu Torkel in Plairs 'Plars' at Lagundo/Algund (Resia/Reschen Pass); Kallmünz at Merano/Meran (Resia/Reschen Pass and Moso/Moos Pass)*; Helmstorf Lana/Lana di Sotto (Resia/Reschen Pass); Sichelburg at Falzes/Pfalzen by Lords of Falzes (Valle Pusteria/Pustertal)** - <u>Migration</u> : reverse partial movement to the lowland patterns due to the limited resources of the highland ones (i.e. phase I: first wave)
14th-15th century CE (Kompass, 2012)	- <u>Fortification</u> : Schlandersburg at Silandro/Schlanders (Resia/Reschen Pass)**
1300 CE (Kompass, 2012)	- <u>Fortification</u> : Trauttmansdorff 'Neuburg' at Merano/Meran (Resia/Reschen Pass and Moso/Moos Pass)*
1312 CE	- <u>Population</u> : 240,000 individuals in Tirol
1326 CE	- <u>Fortification</u> : Melag at Appiano sulla

Heritage-based land use pattern

(Kompass, 2012)	Strada del Vino/Eppan (Adige)**
1346 CE (Kompass, 2012)	- <u>Fortification</u> : Scena at Scena/Schenna at by Petermann von Schenna (Resia/Reschen Pass and Moso/Moos Pass)*
Mid 14th century-1398 CE	- <u>Administration</u> : woods and pasture accessibility agreement
1357 CE (Kompass, 2012)	- <u>Fortification</u> : Fragsburg at Meran/Merano (Resia/Reschen Pass)**
1363 CE (Kompass, 2012)	- <u>Fortification</u> : Schickenburg at Marlengo/Marling (Resia/Reschen Pass)** - <u>Political consolidation/administration</u> : succession of the Counts of Tyrol by the Habsburg's of Austria - <u>Migration</u> : south German miners and labor force
15th century CE	<u>Medieval Tirol economical transition</u> <u>phase II-B</u> <i>In addition to phase II-A:</i> <i>Main economy (rise)</i> - <u>Mining</u> : extensive/booming; copper and silver (i.e. low and highland patterns)
15th -16th centuries CE	<i>Supportive economy</i> <i>'Low and high land patterns'</i> - <u>Mountainous husbandry</u> : further expansion in the low and highland patterns as a response to the increasing population and its food requirements (i.e. early pilot-commercialization); seasonal short-range local cycle - <u>Environmental threat</u> : unbalanced ecology-based food production-consumption balance
1404 CE	- <u>Law</u> : legislative incentives for the impartibility of farmsteads
1415 CE	- <u>Political consolidation/administration</u> : peasants representative in the Tyrolese

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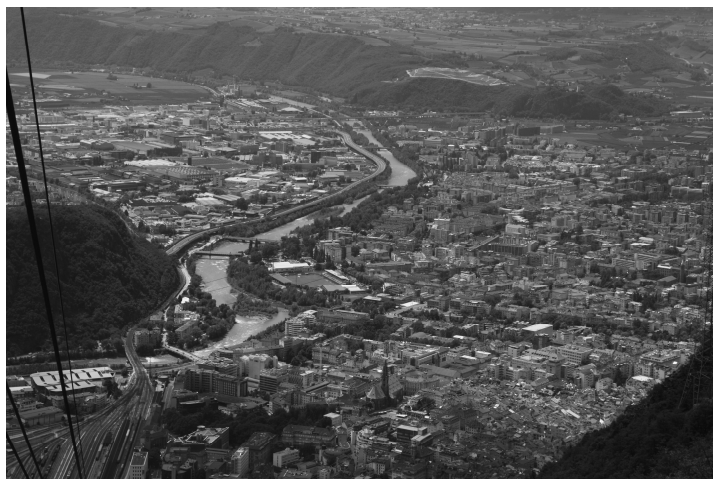
	assembly, including both low and highland patterns
1427 CE	- <u>Population</u> : 360,000 individuals in Tirol
1470 CE (Kompass, 2012)	- <u>Fortification</u> : Prince 'Principesco' at Merano/Meran (Resia/Reschen Pass and Moso/Moos Pass)*; Englar at Appiano sulla Strada del Vino/Eppan by Cristof von Firmian/ Bartholomäus (Adige)***
1475 CE (Kompass, 2012)	- <u>Fortification</u> : Goldrano/Goldrain at Laces/Latsch (Resia/Reschen Pass)**
-----	- <u>Administration</u> : regulation of the sale of land by each commune via a special land commission 'Ortliche Hofekommission'
16th century CE (Kompass, 2012)	- <u>Fortification</u> : Salegg at Caldaro Sulla Strada del Vino/Kaltern by Concius von Campan 'Villa di Mezzo' (Adige)***
16th-17th centuries CE	- <u>Ownership of land</u> : a number of peasants succeed to buy/transfer their farmsteads to full possession (i.e. outright owner)
16th-18th centuries CE	- <u>Population</u> : emigration outflow to Europe
1505 CE (Kompass, 2012)	- <u>Fortification</u> : St. Vigil at Marebbe/Enneberg (East)**
1517 CE (Kompass, 2012)	- <u>Fortification</u> : Prösels at Fiè Allo Sciliar/Völs am Schlern (Brennero/Brenner Pass)**
1525-1526 CE	- <u>Population</u> : an approximate number of 10,000 miners and 30,000 of their dependents inhabited each of the cisalpine and transalpine in South Tyrol/Sudtirol and North Tyrol/Noord Tirol respectively - <u>Foreign influence</u> : the Michael Gaismair German-speaking Tyrolese peasants revolution against the rising of a foreign capitalists class of professional miners and labor force (i.e. south Germans) on the expense of the local Tyrolese (i.e. misdistribution of fortune)

Heritage-based land use pattern

1532-1535 CE	<ul style="list-style-type: none"> - <u>Foreign influence</u>: rise and suppression of the Anabaptists religious movement against the church and state represented in the Habsburgs of Austria
1536 CE (Kompass, 2012)	<ul style="list-style-type: none"> - <u>Fortification</u>: Rubatsch 'Cloz' at Badia/Abtei by Hans von Rubatsch (East)**
Second half of 16 th century CE (Kompass, 2012)	<ul style="list-style-type: none"> - <u>Fortification</u>: Stachelburg at Nalles/Nals (Resia/Reschen Pass)*
1561 CE (Kompass, 2012)	<ul style="list-style-type: none"> - <u>Fortification</u>: Branzoll at Chiusa/Klausen (Brennero/Brenner Pass)**
1590 CE (Kompass, 2012)	<ul style="list-style-type: none"> - <u>Fortification</u>: Kalmünz at Merano/Meran (Resia/Reschen Pass)**
17 th century CE+ (Touriseum) (Kompass, 2012)	<ul style="list-style-type: none"> - <u>Fortification</u>: Stromburg at Appiano sulla Strada del Vino/Eppan (Adige)** - <u>Tourism 'early tourists'</u>: summer local tourism to the upland mountain ranges and spa areas (i.e. Sommerfrische)
17 th -18 th centuries CE	<ul style="list-style-type: none"> - <u>Market</u>: Tyrolese roving merchants to Europe - <u>Fortification</u>: San Valentino by Lords Herren von Fuchs at Steinegger (prior 1600) (Adgie)*****
<p style="text-align: center;"><u>Renaissance Tirol economical transition</u></p> <p style="text-align: center;"><i>Main economy (decline)</i> <i>'Low and high land patterns'</i></p> <p>Early 1600s CE (Kompass, 2012)</p>	
<ul style="list-style-type: none"> - <u>Transportation</u>: lowland economic activity between southern Germany and northern Italy (decline) - <u>Trade accommodation facility</u>: lowland taverns and hostleries for merchants and travelers as an early example of the later tourism accommodation facilities (decline) - <u>Wage labor</u>: smiths, carters and wainwrights in the lowland Tyrolese towns (decline) - <u>Mining</u>: exhaustion of copper and silver reserves (i.e. low and highland patterns) 	

Human Occupation Development

	<p>(decline)</p> <ul style="list-style-type: none"> - <u>Vineyards & Fruits</u>: lowland pattern (i.e. partial conversion of plowland and meadows) (rise) (Fig. 81) <p style="text-align: center;"><i>Supportive economy (constant)</i> <i>'Low and high land patterns'</i></p> <ul style="list-style-type: none"> - <u>Mountainous husbandry</u>: low and highland patterns (i.e. local consumption); seasonal short-range local cycle - <u>Weaving?</u> Equivalent to the later handicrafts (i.e. local consumption) - <u>Charcoal/Firewood</u>: low and highland patterns (i.e. local consumption) - <u>Hunting</u>: low and highland patterns (i.e. local consumption)
1610 CE (Kompass, 2012)	<ul style="list-style-type: none"> - <u>Fortification</u>: Matschatsch at Appiano sulla Strada del Vino/Eppan (Adige)**
1622-1641 CE	<ul style="list-style-type: none"> - <u>Fortification</u>: Fischburg at Santa Cristina Valgardena/S. Cristina-Gherdëina in Ladino (East)**
1630 CE	<p style="text-align: center;"><i>Main economy (decline)</i> <i>'Low and high land patterns'</i></p> <ul style="list-style-type: none"> - <u>Mining</u>: official closure
1650 CE (Kompass, 2012)	<ul style="list-style-type: none"> - <u>Fortification</u>: Greifenburg at Appiano sulla Strada del Vino/Eppan (Brennero/Brenner and Reschen/Resia junction)** - <u>Population</u>: 500,000 individuals in Tirol
1669 CE	<ul style="list-style-type: none"> - <u>Education</u>: establishment of Innsbruck University
1675 CE (Kompass, 2012)	<ul style="list-style-type: none"> - <u>Fortification</u>: Sagburg at Bolzano/Bozen (Brennero/Brenner and Reschen/Resia junction)**
1690 CE (Kompass, 2012)	<ul style="list-style-type: none"> - <u>Fortification</u>: Liebenrain at Barbiano/Barbian (Brennero/Brenner)**
18 th century CE (Kompass, 2012)	<ul style="list-style-type: none"> - <u>Fortification</u>: Fonteklaus at Chiusa/Klausen (Brennero/Brenner Pass)** - <u>Education</u>: establishment of local



(a - 2011 CE)



(b - 2011 CE)

Figure 74 (a) Bolzano/Bozen 300m ASL on the route of Resia/Reschen and Brennero/Brenner Passes, F. Adige/Etsch Valley [Appiano sulla Strada del Vino/Eppan a. d. Weinstrabe 404m ASL] ('Alto Adige/Südtirol' province) – July 3, 2011; (b) Brunico/Bruneck 886m ASL [Ahr. T. Aurino] (Val Pusteria/Pustertal, 'Alto Adige/Südtirol' province) – November 1, 2011: SinaiAlps Project 2011-2012 CE



(a - 2011 CE)



(b - 2011 CE)

Figure 75 (a) Valle di Anterselva/Anthol zer Tal [Collalto/Hochgall 3436m ASL and Stalle/Staller Sattel Pass 2052m ASL] (Val Pusteria/Pustertal, 'Alto Adige/Südtirol' province) - October 14, 2011; (b) F. Adige/Etsch Valley 900m ASL, Sluderno/Schluderns [Plagabella/Plaschweller 2534m ASL and M. Blais di Brato/Verborgene Blais 2601m ASL] (Val Venosta/Vinschgau, 'Alto Adige/Südtirol' province) - November 19, 2011: SinaiAlps Project 2011-2012 CE



(a - 2011 CE)



(b - 2011 CE)

Figure 76 (a) Valle di Anterselva/Anthol zer Tal, Valle di Vila/Wielental and Rienz Valley vicinity [Collalto/Hochgall 3436m ASL] (Val Pusteria/Pustertal, 'Alto Adige/Südtirol' province) - November 1, 2011; (b) Hürtmuller Moos Bitop 928m ASL, Brunico/Bruneck [Krinner Kpof 1387m ASL] (Val Pusteria/Pustertal, 'Alto Adige/Südtirol' province) - November 1, 2011: SinaiAlps Project 2011-2012 CE



(a - 2011 CE)



(b - 2011 CE)

Figure 77 (a) San Giacomo/Anthol and St. Jakob meadow 1111m ASL, Soprabolzano/Oberbozen (Renon/Ritten, 'Alto Adige/Südtirol' province) - July 3, 2011; (b) Schwaigkofler, Herzleitner, Gismann and Mandl meadows 1576m ASL, Schwarzseepitze 2071m ASL (Renon/Ritten, 'Alto Adige/Südtirol' province) - July 31, 2011: SinaiAlps Project 2011-2012 CE



(a - 2011 CE)



(b - 2011 CE)

Figure 78 (a & b) Colle dei Signori/Herrenkohlern meadow 1180m ASL [Sciliar/Schlern 2448m ASL] (Colle/Kohlern, 'Alto Adige/Südtirol' province) - October 5, 2011: SinaiAlps Project 2011-2012 CE



(a - 2011 CE)



(b - 2011 CE)

Figure 79 (a) Untergsteir meadow 1372m ASL, Mittelstation (Merano/Meran, 'Alto Adige/Südtirol' province) - December 8, 2011; (b) Moaramhof Gaben farmstead 860m ASL, Brunico/Bruneck (Val Pusteria/Pustertal, 'Alto Adige/Südtirol' province) - November 1, 2011: SinaiAlps Project 2011-2012 CE



(a - 2011 CE)



(b - 2011 CE)

Figure 80 (a & b) Timber and firewood collection point ‘Traun’ 11860m ASL, San Cipriano/St. Zyprian (Purgametschtal, ‘Alto Adige/Südtirol’ province) – December 4, 2011: SinaiAlps Project 2011-2012 CE



(a - 2011 CE)



(b - 2011 CE)

Figure 81 (a) Firmiano/Sigmundskron vineyards 339m ASL, Ponte Adige/Sigmundskron (Bolzano/Bozen, 'Alto Adige/Südtirol' province) - October 30, 2011; (b) Rubein and Pienzenau vineyards 360m ASL, Maia Bassa/Untermals [Hochsulfen 1345m ASL] (Merano/Meran, 'Alto Adige/Südtirol' province) - October 31, 2011: SinaiAlps Project 2011-2012 CE

Heritage-based land use pattern

	schools
	<p style="text-align: center;"><i>Main economy</i> <i>'Low and high land patterns'</i></p> <p>- <u>Wage labor</u>: 30,000 rural individuals are involved in a seasonal labor force migration (rise)</p>
1703 CE	- <u>Foreign influence</u> : Bavarian invasion for Tirol
2 nd half of 18 th century CE	<p style="text-align: center;"><i>Main economy</i> <i>'Lowland pattern'</i></p> <p>- <u>Industrialization</u>: early phase; early orientation towards agricultural commercialization (limited)</p>
1738 CE (Kompass, 2012)	- <u>Fortification</u> : Prielhof at Appiano Monte (Adige)*****
1754 CE	- <u>Population</u> : 593,000 individuals in Tirol
1770-1785 CE	- <u>Law</u> : establishment of the Closed Holdings 'Geschlossene Hofe', characterized by Impartiality
1780 CE	<p style="text-align: center;"><i>Supportive economy</i> <i>'Low and high land patterns'</i></p> <p>- <u>Mountainous husbandry</u>: low and highland patterns; 46,000 self-sufficient peasants 'rural' and another 61,000 peasants 'rural' are involved in other economical activities (i.e. local consumption); seasonal short-range local cycle</p> <p>- <u>Handicrafts</u>: cottage industries such as weaving, hat-making, basket-weaving, embroidery on leather, production of artificial flowers, wood carving, distilling...etc.</p>
1796 CE	- <u>Sacredness</u> : "official recognition of a traditional Tyrolese devotion to the Sacred Heart of Jesus, a cult that symbolically underlined the role of the Tyrolese as a chosen people through the postulate of a special "covenant" between the Tyrolese and Christ" (Cole et al., 1999)

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1796-1797 CE	<ul style="list-style-type: none"> - <u>Foreign influence</u>: the Tyrolese under the Habsburgs fight against the French and Bavarians under Napoleon
Early 19 th century CE	<p style="text-align: center;"><i>Supportive economy</i> <i>'Low and high land patterns'</i></p> <ul style="list-style-type: none"> - <u>Mountainous husbandry</u>: introduction of potatoes
April 1808 CE (Touriseum)	<ul style="list-style-type: none"> - <u>Foreign influence</u>: the Andreas Hofer Tyrolese revolution against the French and Bavarians under Napoleon - <u>Tourism 'early advertisement'</u>: plays, poems and songs by the English and Germans about Andreas Hofer, as <i>"The places associated with the Tyrolean uprisings become sights"</i>
1809 CE	<p style="text-align: center;"><i>Main economy (decline)</i> <i>'Low and high land patterns'</i></p> <ul style="list-style-type: none"> - <u>Transportation</u>: blockage of the lowland economic activity between southern Germany and northern Italy by the French and Bavarians - <u>Wage labor</u>: rural individuals are involved in a seasonal labor force migration
1810-1815 CE	<ul style="list-style-type: none"> - <u>Administration</u>: the French and Bavarians force a temporary boundary, as most of South Tyrol/Sudtirol fall under the Bavarians
1813 CE	<ul style="list-style-type: none"> - <u>Foreign influence</u>: establishment of the pro-Italian Carbonari in Romance Tyrol 'Trentino/Trento'
1831 CE	<ul style="list-style-type: none"> - <u>Foreign influence</u>: establishment of the expansionist pro-Italian Mazzini's Young Italy Society in Italy 'mainland', intruding Romance Tyrol 'Trentino/Trento'
1835 CE	<ul style="list-style-type: none"> - <u>Population</u>: 719,000 individuals in Tirol
1848 CE	<ul style="list-style-type: none"> - <u>Foreign influence</u>: partial Italian invasion for Romance Tyrol 'Trentino/Trento'
2 nd half of 19 th century CE (Kompass, 2012)	<ul style="list-style-type: none"> - <u>Fortification</u>: Reichtenthal at Termeno Sulla Strada Del Vino/Tramin (Adige)**

Heritage-based land use pattern

1866 CE	- <u>Foreign influence</u> : partial Italian invasion for Romance Tyrol 'Trentino/Trento'
1867 CE (Touriseum)	- <u>Transportation</u> : Brenner railway line between Innsbruck (i.e. North Tyrol/Noord Tirol) and Bolzano (i.e. South Tyrol/Sudtiroil)
1868 CE	- <u>Law</u> : liberalization of inheritance by Habsburg's monarchy
1870-1890 CE (Touriseum)	- <u>Tourism accommodation facility</u> : foreign investments at South Tyrol/Sudtiroil (e.g. hotels: Wiener Baugesellschaften); antiques as souvenirs; emergence of remote Alpine refugees
1880 CE	- <u>Political consolidation/administration</u> : establishment of the pro-German Deutscher Schulverein 'later German-Austrian Alpine Association' in Romance Tyrol 'Trentino/Trento' (i.e. identity and culture consolidation)
1880-1920s CE	- <u>Population</u> : migration outflow to Europe
1885 CE	- <u>Foreign influence</u> : establishment of the expansionist pro-Italian Pro Patria in Italy 'mainland', intruding Romance Tyrol 'Trentino/Trento'
1889 CE	- <u>Foreign influence</u> : i) establishment of the expansionist pro-Italian Dante Alighieri in Italy 'mainland', intruding Romance Tyrol 'Trentino/Trento', dedicated to the Italian-speaking societies abroad (i.e. identity and culture consolidation); ii) establishment of the expansionist pro-German Allgemeiner Schulverein in Germany 'mainland', intruding Romance Tyrol 'Trentino/Trento' (i.e. identity and culture consolidation) - <u>Political consolidation/administration</u> : establishment of the Schulverein

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	<p>Sudmark in Austria 'mainland', being active in Romance Tyrol 'Trentino/Trento' (i.e. identity and culture consolidation)</p>
1890 CE (Touriseum)	<p>- <u>Foreign influence</u>: establishment of the expansionist Pan-German League in Germany 'mainland', supporting the Colonial League and Society for Germans Abroad</p> <p>- <u>Tourism and Black-White Photography</u>: emergence of stereoscopic photography</p>
1890-1914 CE (Touriseum)	<p>- <u>Tourism accommodation facility</u>: emergence of luxuries hotels (e.g. Karersee Hotel), as Tyrol becomes a fashionable tourism destination for middle and upper classes</p>
1894 CE	<p>- <u>Ownership of land</u>: purchase of the land of the Italian-speaking community in Romance Tyrol 'Trentino/Trento' by the pro-German Allgemeiner Schulverein and Schulverein Sudmark</p>
1900 CE	<p>- <u>Law</u>: liberalization of inheritance in Tirol</p>
1905 CE	<p>- <u>Foreign influence</u>: Innsbruck University riots between the German and Italian students</p>
1905 CE	<p>- <u>Ownership of land</u>: purchase of the land of the Italian-speaking community in Romance Tyrol 'Trentino/Trento' by the Pan-German Association 'Austrian National Socialism' under Georg von Schonerer and Karl Herrmann</p>
1910 CE	<p>- <u>Population</u>: 947,000 individuals in Tirol</p>
1919 CE	<p>- <u>Peace Treaty</u>: St. Germain; South Tyrol/Sudtirol and Romance Tyrol 'Trentino/Trento' became Italian post World War I 'WWI', concurrently with the refusal of the Tyrolese delegation</p>
1920-1922 CE	<p>- <u>Political consolidation/administration</u>: rise of Fascism in South Tyrol/Sudtirol</p>

Heritage-based land use pattern

	<p>'Alto Adige' and Romance Tyrol 'Trentino/Trento' (i.e. Italianization), resisted by the German People's League</p>
1920-1935 CE (Touriseum)	<p>- <u>Tourism</u>: Dopolavoro 'After Work' fascist domestic tourism marketing campaign</p>
1922-1943 CE	<p>- <u>Alliance</u>: Adolf Hitler's speech about the sacrifice of the Tyrolese case within the pan-German sphere in favor of an alliance with rising Fascism in Italy (i.e. Italianization)</p> <p>- <u>Political consolidation/administration</u>: the suppression of the Tyrolese autonomy attempts; urban bureaucratic control over the rural life aspects</p>
1924 CE	<p>- <u>Electricity</u>: introduction of the hydro-electrical plants to South Tyrol/Sudtirol and Romance Tyrol 'Trentino/Trento'</p>
1924-1935 CE	<p><i>Main economy</i> <i>'Lowland pattern'</i></p> <p>- <u>Industrialization</u>: mass process in the vicinity of Bolzano/Bozen (rise)</p>
1926 CE	<p>- <u>Industrialization</u>: introduction of chemical industry to South Tyrol/Sudtirol and Romance Tyrol 'Trentino/Trento'</p>
1929 CE	<p>- <u>Law</u>: abrogation of the Tyrolese legislations on impartible inheritance of land</p>
1929-1954 CE	<p>- <u>Ownership of land</u>: pressures for the division of the German-speaking households/farmsteads; the establishment of the pro-Italian Ente Nazionale per le Tre Venezie in order to transfer the ownership of the land from the German-speaking owners to the Italian-speaking ones</p>
Late 1920s-1930s CE	<p><u><i>Global Depression economical transition</i></u></p> <p><i>Main economy (decline)</i> <i>'Low and high land patterns'</i></p>

Human Occupation Development

- Industrialization: Bolzano/Bozen (i.e. lowland pattern)
- Transportation: lowland economic activity between southern Germany and northern Italy
- Tourism/Trade accommodation facility: lowland taverns and hostelrys for merchants and tourists (i.e. small no. of German tourists due to the Nazis limitations of monetary exports)
- Wage labor: rural individuals are involved in a seasonal labor force migration (i.e. low wages; low and **highland** patterns)
- Vineyards & Fruits: lowland pattern

*Supportive economy (decline)
'Low and **high land** patterns'*

- Mountainous husbandry: seasonal short-range local cycle (i.e. local consumption)
- Handicrafts (i.e. local consumption)
- Charcoal/Firewood (i.e. local consumption)
- Hunting (i.e. local consumption)
- Ownership of land: the fascists fail to purchase the lands of the German-speaking population in the countryside (i.e. pro-German rural community)
- Urban plan: historical town centers of Austrian architecture; newly introduced suburbs and modern centers of fascist architecture
- Population: Italian-speaking majority in urban areas and German-speaking majority in rural ones

1930s CE

1932 CE

- Foreign influence: rise of Nazism in South Tyrol/Sudtirol 'Alto Adige' and the activation of the Deutscher Schulverein 'later German-Austrian Alpine Association' under the German League for Germanism Abroad (i.e.

Heritage-based land use pattern

	Austria mainland establishment)
1939 CE	- <u>Population</u> : the relocation of the willing Tyrolese in the rising German Reich or the acceptance of Italianization
1940-41 CE	- <u>Population</u> : the highest relocation rate of the willing Tyrolese in the rising German Reich
1943 CE	- <u>Foreign influence</u> : Nazis control over South Tyrol/Sudtirol 'Alto Adige' and Romance Tyrol 'Trentino/Trento' (i.e. temporary unification of Historical Tirol); establishment of the pro-German South Tyrolese People's Party 'Sudtiroler Volkspartei - SVP'
May 3, 1945 CE	- <u>Political consolidation/administration</u> : Italian re-control over South Tyrol/Sudtirol 'Alto Adige' and Romance Tyrol 'Trentino/Trento'
1946 CE	- <u>Peace Treaty/Agreement</u> : first Astro-Italian agreement about the recognition of the German minority rights and the establishment of the Trentino-Alto Adige/Tiroler Etschland (i.e. failure of agreement and rise of Befreiungsausschuss Südtirol - BAS 'Committee for the liberation of South Tyrol')
1946-1955 CE (Touriseum)	- <u>Tourism</u> : mass tourism (rise)
2 nd half of 20 th century	<i>Supportive economy</i> <i>'Low and high land patterns'</i> - <u>Mountainous husbandry</u> : less no. of cheap due to the availability of wool in the new markets at a competitive price
1954 CE	- <u>Law</u> : prohibition of Closed Holdings 'Geschlossene Hofe'
1960-1972 CE (Touriseum)	- <u>Transportation</u> : expansion in motorways establishment
1960s CE	- <u>Migration</u> : reverse movement to the lowland patterns due to the availability of

large number of new wage-based occupations (i.e. phase II: first wave)

- Education: mandatory school education; establishment of trade schools, focusing on cooking, waiting on tables, stonemasonry, laying ceramic tiles and roofing

- Jobs: i) urban: wage-based; ii) rural: agro-pastoralism, trucking/tractors, food processing, construction and tourism; tourism sector: chambermaids, cooks, waiters, bell hops...etc. at hotels, inns, restaurants and bars, in addition to taxi drivers

- Trade: livestock

- Administration: small government pensions; government loans for outright purchase of land and/or agricultural machinery

- Revenue: land value is determined by the no. of cattle it can hold

Post World War II 'WWII' economical transition (Fig. 82 & 83)

Main economy (rise)

*'Low and **high land** patterns'*

- Industrialization: Bolzano/Bozen (i.e. lowland pattern), northern Italy and Germany

- Transportation: lowland economic activity between southern Germany and northern Italy and Europe wide

- Tourism accommodation facility: low and **highland** patterns taverns and hostleries for tourists (i.e. mass tourism) (Fig. 84)

- Wage labor: rural individuals are involved in a seasonal labor force migration (i.e. low and **highland** patterns; ex. i) seasonal winter employment at the ski resorts; ii) seasonal summer employment during harvest times); relative shortage of labor force in



(a - 2011 CE)



(b - 2011 CE)

Figure 82 (a & b) Waldfriedhof WWI-WWII Alpine front forest cemetery 'Christian, Muslim and Jewish'—order based on no. of tombs 'wooden'—886m ASL, Brunico/Bruneck [Schloss Bruneck] (Val Pusteria/Pustertal, 'Alto Adige/Südtirol' province) – November 1, 2011: SinaiAlps Project 2011-2012 CE



(2011 CE)

Figure 83 Waldfriedhof WWI-WWII Alpine front forest cemetery 'Muslim section' 886m ASL, Brunico/Bruneck (Val Pusteria/Pustertal, 'Alto Adige/Südtirol' province) - November 1, 2011: SinaiAlps Project 2011-2012 CE



(2011 CE)

Figure 84 Meran 2000, Naifkapelle 720m ASL-Piffling 1980m ASL [Cigot/Tschigot 2998m ASL] (Merano/Meran, 'Alto Adige/Südtirol' province) - December 8, 2011

Heritage-based land use pattern

	<p>remote and/or highland farmsteads; rural individuals work as carpenters (e.g. wagons, plows, sleds...etc.), coopers, millers, roofers, house painters...etc.</p> <p>- <u>Vineyards & Fruits</u>: lowland pattern (i.e. national-domestic/international market); fruits including apples and pears</p> <p><i>Supportive economy (relative rise)</i> <i>'Low and high land patterns'</i> <i>(commercialization/modern-machinery agriculture)</i></p> <p>- <u>Mountainous husbandry</u>: economically infeasible remote and/or small households/farmsteads (i.e. low profile traditional highland pattern), managed by relatively old individuals; less land grow potatoes (i.e. local-regional consumption)</p> <p>- <u>Handicrafts</u> (i.e. local-regional consumption)</p> <p>- <u>Charcoal/Firewood</u> (i.e. local consumption)</p> <p>- <u>Hunting</u> (i.e. local consumption)</p>
1960-1961 CE	<p>- <u>Peace Treaty/Agreement</u>: failure of the United Nations 'UN' Astro-Italian negotiations</p> <p><i>Main economy</i></p>
1961-1965 CE (Touriseum)	<p>- <u>Tourism</u>: decline in the no. of Italian tourists, concurrently with the rise in the no. of Austrian and German ones</p>
1969 CE	<p>- <u>Peace Treaty/Agreement</u>: second Astro-Italian agreement about the autonomy of the sole province of South Tyrol/Sudtirol 'Alto Adige'</p>
1971 CE (Touriseum)	<p>- <u>Transportation</u>: motorway between Innsbruck and Brennero/Brenner</p>
1972-1985 CE (Touriseum)	<p>- <u>Cultural heritage loss</u>: negative impacts of mass tourism</p> <p>- <u>Environmental threat</u>: negative impacts of mass tourism</p>

Human Occupation Development

1972-1992 CE	- <u>Administration</u> : gradual autonomy of South Tyrol/Sudtiroi 'Alto Adige' (i.e. 90% taxes reinvestment in the province)
1974 CE (Touriseum)	- <u>Transportation</u> : motorway between Brennero/Brenner and Verona
1980s-21st century CE (Touriseum)	- <u>Law</u> : enforcement of natural-cultural resources conservation-preservation laws and regulations
1995 CE	- <u>Administration</u> : Austro-Italian (i.e. historical Tirol) full cross-border mobility under the sphere of the European Union

Table 39 Socioeconomic transitions timeline of the High Mountains of Sinai Peninsula (Middle East) and South Tyrol-Sudtiroi/Alto Adige (Alps-Europe)

High Mountains of Sinai Peninsula (Middle East)	South Tyrol-Sudtiroi/Alto Adige (Alps-Europe)
Chalcolithic [Copper Age] (4,700 - 3,150 BCE) (Harper Collins, 1998) Climate: dryness → wet summer rain → warm <i>Sedentary villages 'tribal chiefdoms'</i> <i>(burials in corner of rooms and under floors)</i> - <u>Husbandry</u> : lowland pattern - <u>Copper mining</u> : lowland pattern	Chalcolithic [Copper Age] (3,500 - 2,300 BCE) (Cole et al., 1999) (South Tyrol Museum of Archeology, 2012)
Bronze Age I (3150 BCE) (Beit-Arieh, 2003) Climate: constant; almost similar to nowadays <i>Sedentary villages</i> - <u>Husbandry</u> : lowland pattern	Climate: steady warming trend (glaciers retreat + tree line upward expansion) <i>Flamboyant culture</i>

Heritage-based land use pattern

limited agriculture; low-land and highland patterns seasonal herding cycle

- Copper mining: lowland pattern
- Trade: lowland pattern, animals and copper with South Canaan 'Land of Palestine'

- Agriculture: lowland
- Herding: lowland
- Hunting: **highland**
- Gathering
- Mining: copper
- Trade: copper and copper objects

Bronze Age (2,300-1,000 BCE)

(Cole et al., 1999)

(South Tyrol Museum of Archeology, 2012)

Laugen-Melaun culture

Urnfield culture

Small bands 'husbandry/

agro-pastoral/mixed-agriculture'

(crimination and burials in urns)

- Agriculture: lowland
- Herding: lowland
- Hunting: **highland**
- Gathering
- Mining: bronze and copper
- Trade: bronze, copper and tin, ores and objects (i.e. jewelry and armors)
- Transportation: salt and metal works on horse-drawn vehicles

12th century CE

(Cole et al., 1999)

Medieval Tirol economical

transition phase I

Schwaige holdings

'households/farmsteads'

('husbandry/agro-pastoralism/

mixed-agriculture')

- Mining: copper
- Mountainous agriculture: low and **high land** patterns (i.e. local consumption)
- Herding: low and **high land** patterns (i.e. local consumption)

- Weaving? Equivalent to the later handicrafts
(i.e. local consumption)
- Charcoal/Firewood: low and **high land** patterns
(i.e. local consumption)
- Hunting: low and **high land** patterns
(i.e. local consumption)

13th -14th centuries CE
(Cole et al., 1999)

Mid-14th century CE

(Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)

Economy of the Gebaliya tribe

Main economy

- Transportation: pilgrims and travelers

Supportive economy

- Mountainous agriculture: orchards' goods
(i.e. local consumption + trade)
- Herding: seasonal cycle 'Arabic: *rihla*'
(i.e. local consumption + trade)
- Charcoal: acacia and tamarisk trees
(i.e. local consumption + trade)
- Hunting
(i.e. local consumption)

Medieval Tirol economical transition phase II-A

Main economy (rise)

'Lowland pattern'

- Transportation: lowland economic activity between southern Germany and northern Italy; Venice/Verona north-south trade (i.e. linen, wool, furs, pigments, iron tools and precious metals) and south-north trade (i.e. cottons, silks, spices and glass)
- Trade accommodation facility: lowland taverns and hostels for merchants and travelers as an early example of the later tourism accommodation facilities
- Wage labor: smiths, carters and wainwrights in the rising lowland Tyrolean towns

Supportive economy

'Low and high land patterns' (rise)
(Inflation/fixed rents impact)

- Mountainous husbandry: expansion in the low and **high land** patterns as a response to the increasing population and its food

Heritage-based land use pattern

requirements (i.e. early pilot-commercialization; local-regional consumption); seasonal short-range local cycle

- Weaving? Equivalent to the later handicrafts

(i.e. local consumption)

- Charcoal/Firewood: low and **high land** patterns

(i.e. local consumption)

- Hunting: low and **high land** patterns

(i.e. local consumption)

15th century CE

(Cole et al., 1999)

Medieval Tirol economical

transition phase II-B

In addition to phase II-A:

Main economy (rise)

- Mining: extensive/booming; copper and silver (i.e. low and **high land** patterns)

Early 1600 CE

(Cole et al., 1999)

Renaissance Tirol economical

transition

Main economy (decline)

*'Low and **high land** patterns'*

- Transportation: lowland economic activity between southern Germany and northern Italy (decline)

- Trade accommodation facility: lowland taverns and hostels for merchants and travelers as an early example of the later tourism accommodation facilities (decline)

- Wage labor: smiths, carters and wainwrights in the lowland Tyrolean towns (decline)

- Mining: exhaustion of copper and silver reserves (i.e. low and **high**

Human Occupation Development

land patterns) (decline)

- Vineyards & Fruits: lowland pattern (i.e. partial conversion of plowland and meadows) (rise)

Supportive economy (constant)

*'Low and **high land patterns**'*

- Mountainous husbandry: low and **high land patterns**

(i.e. local consumption); seasonal short-range local cycle

- Weaving? Equivalent to the later handicrafts

(i.e. local consumption)

- Charcoal/Firewood: low and **high land patterns**

(i.e. local consumption)

- Hunting: low and **high land patterns**

(i.e. local consumption)

1914-1918 CE

(Glassner, 1974) (Perevolotsky, 1981)

(Rabinowitz, 1985) (Perevolotsky et

al., 1989) (Lavie, 1991) (Hobbs, 1995)

(Marx, 2003) (Shams, 2010a, 2010b,

2011b, 2011c, 2011d, 2011e, 2011f,

2012a, 2012b, 2012c)

Late 1920s-1930s CE

(Cole et al., 1999)

Post World War I 'WWI' economical transition

for the Gebaliya tribe due to military actions

Main economy (decline)

- Transportation: declined and limited to the High Mountains of Sinai Peninsula

Supportive economy (partial local rise)

- Wage labor: mainly in Holy Monastery of St. Catherine; centralized accessibility to the manganese mines via the

Global Depression economical transition

Main economy (decline)

*'Low and **high land patterns**'*

- Industrialization: Bolzano/Bozen (i.e. lowland pattern)

- Transportation: lowland economic activity between southern Germany and northern Italy

- Tourism/Trade accommodation facility: lowland taverns and hostels for merchants and tourists (i.e. small no. of German tourists due to the Nazis limitations of monetary

Heritage-based land use pattern

governmental sheikhs (limited) 'the formation of South Sinai mining economical belt, Gulf of Suez' (Fig. 20)

- Mountainous agriculture: local consumption; 100 families worked 300 orchards (rise)
- Herding: local consumption; sheep and goat; meat and milk (rise)
- Charcoal: local consumption (decline)
- Hunting: local 'Fox, Hyrax, Hare, Hyena, Ibex, Cat Felis, Wolf, Feral Donkey and Leopard' (low profile)

1967 CE

(Glassner, 1974) (Perevolotsky, 1981) (Rabinowitz, 1985) (Perevolotsky et al., 1989) (Lavie, 1991) (Hobbs, 1995) (Hobbs, 1998) (Marx, 1999) (Marx, 2003) (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c)

Post Six Days War economical transition for the Gebaliya tribe due to military actions

Main economy (rise)

- Transportation → tourism: Eco-cultural tourism in the High Mountains of Sinai Peninsula 'the formation of South Sinai tourism economical belt, St. Catherine - Gulf of Aqaba' (Fig. 22)
- Wage labor: oilfields, civilian-military construction, mechanics and

exports)

- Wage labor: rural individuals are involved in a seasonal labor force migration (i.e. low wages; low and **high land patterns**)
- Vineyards & Fruits: lowland pattern

Supportive economy (decline)

*'Low and **high land patterns**'*

- Mountainous husbandry: seasonal short-range local cycle (i.e. local consumption)
- Handicrafts (i.e. local consumption)
- Charcoal/Firewood (i.e. local consumption)
- Hunting (i.e. local consumption)

1960s CE

(Cole et al., 1999)

Post World War II 'WWII' economical transition

Main economy (rise)

*'Low and **high land patterns**'*

- Industrialization: Bolzano/Bozen (i.e. lowland pattern), northern Italy and Germany
- Transportation: lowland economic activity between southern Germany and northern Italy and Europe wide
- Tourism accommodation facility: low and **high land patterns** taverns and hostleries for tourists (i.e. mass

Human Occupation Development

tourism services 'decentralized-sole application'

Supportive economy (decline)

- Mountainous agriculture: local consumption; 30-40 families worked 120 orchards (decline)
- Herding: local consumption; sheep and goat; meat and milk (decline)
- Charcoal: local consumption (limited by law)
- Hunting (prohibited)

Illegal economy (relatively considerable)

- Smuggling: the Israeli military administration moderates the smuggling activities against the Nile Valley (regulated)

tourism)

- Wage labor: rural individuals are involved in a seasonal labor force migration (i.e. low and **high land** patterns; ex. i) seasonal winter employment at the ski resorts; ii) seasonal summer employment during harvest times); relative shortage of labor force in remote and/or **high land** farmsteads; rural individuals work as carpenters (e.g. wagons, plows, sleds...etc.), coopers, millers, roofers, house painters...etc.
- Vineyards & Fruits: lowland pattern (i.e. national-domestic/international market); fruits including apples and pears

Supportive economy (relative rise)

*'Low and **high land** patterns'*

(commercialization/modern-machinery agriculture)

- Mountainous husbandry: economically infeasible remote and/or small households/farmsteads (i.e. low profile traditional **high land** pattern), managed by relatively old individuals; less land grow potatoes (i.e. local-regional consumption)
- Handicrafts (i.e. local-regional consumption)
- Charcoal/Firewood (i.e. local consumption)
- Hunting (i.e. local consumption)

1983 CE

(Dames & Moore 'USAID', 1979-1985) (Rabinowitz, 1985) (Perevolotsky et al., 1989) (Lavie, 1991) (Hobbs, 1995) (Hobbs, 1998) (Marx, 1999) (Marx, 2003) (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f,

Heritage-based land use pattern

2012a, 2012b, 2012c)

**Post Camp David Peace Treaty
economical transition for the
Gebaliya tribe due to military-
political actions 'Camp David Peace
Treaty'**

Main economy (decline)

- Tourism: Eco-cultural tourism in the High Mountains of Sinai Peninsula
- Wage labor: oilfields, civilian-military construction, mechanics and tourism

Supportive economy (rise)

- Mountainous agriculture: local consumption (rise)
- Herding: local consumption; sheep and goat; meat and milk (rise)
- Charcoal: local consumption (limited)
- Hunting (limited-prohibited)

Illegal economy (rise)

- Smuggling: the activities back in action (prohibited)

Late 1990s- early 2000s CE

1972-1992 CE

- Administration: gradual autonomy of South Tyrol/Sudtiroi 'Alto Adige' (i.e. 90% taxes reinvestment in the province)

1995 CE

- Administration: Austro-Italian (i.e. historical Tirol) full cross-border mobility under the sphere of the European Union

2006-2010 CE

**Post European Commission SSRDP
'South Sinai Regional Development
Program'**

Main economical activity:

- Eco-cultural tourism*
- Tourism services and natural-cultural resources conservation

Rising supportive-economical activity:

- Medicinal plants**
- Handicrafts***

Traditional supportive-economical activity:

- Mountainous agriculture****(i.e. constant at low level)
- Herding (i.e. constant at low level)
- Charcoal production (i.e. very limited)

Extinct traditional supportive-economical activity:

- Hunting (prohibited by law)

Illegal supportive economical activity:

- Smuggling (prohibited by law)

2011 CE

The Egyptian National Reforms Revolution of January 25, 2011 CE

Main economical activity (partial decline 33-40%):

- Eco-cultural tourism*
- Tourism services and natural-cultural resources conservation

Rising supportive-economical activity (decline):

- Medicinal plants** (Fig. 32)
- Handicrafts***

Traditional supportive-economical activity (constant):

- Mountainous agriculture****(i.e. constant at low level)
- Herding (i.e. constant at low level)
- Charcoal production (i.e. very limited)

Extinct traditional supportive-economical activity (constant):

Heritage-based land use pattern

- | | |
|---|--|
| <ul style="list-style-type: none">- Hunting (prohibited by law) <u>Illegal supportive economical activity (rise):</u> <ul style="list-style-type: none">- Smuggling (prohibited by law) | |
|---|--|

In order to realize the scale of socioeconomic activities and land use patterns, the elevation ranges within both selected study-areas are classified into two patterns:

- 1 lowland pattern 'easily accessible' (i.e. low-elevated upland areas, 900-950/1550-1600m ASL)
- 2 highland pattern 'remote' (i.e. high-elevated upland areas, 1550-1600m ASL to mountain summits).

The Sinai case is characterized by a central highland pattern; it is an undivided unit and cut with deep gorges above 1550-1600m ASL, while the lowland pattern is located at the perimeter of the mountain range (Shams, 2011f). The Alpine case is characterized by consecutive mountain ranges (i.e. highland pattern), deeply cut by valleys below 1550-1600m ASL and intruded by the lowland pattern (Kompass, 2011). Topographically, the upper elevation limit of the Alpine case is higher by 1000m than the Sinai one. For example as shown in Figure 1, an elevation of 2300m ASL in Sinai is almost the highest summits altitude, while an elevation of 2450m ASL in the Alps is still an upstream area of a highland valley.

7.3 The rise of highland patterns

Around 3000 BCE (Sinai Bronze Age I/Alpine Chalcolithic 'Copper Age') (Table 39), sedentary villages were established at lowland patterns, based on husbandry, copper mining and trade economy, as the Alpine hunting and gathering activities were still in action (Cole et al., 1999) (South Tyrol Museum of Archeology, 2012), as such activities were totally abandoned in Sinai since the Pottery Neolithic [New Stone Age] (6,000-4,700 BCE) due to the limited environmental capacity (Harper Collins, 1998) (Beit-Arieh, 2003).

Paradoxically, the Sinai economical profile did not change over 3,340 years, till 337 CE upon the early consolidation of the Byzantine monastic settlements and the establishment of the only fortified structure in the region in 530-545 CE (i.e. Holy Monastery of St. Catherine) (Shuqier, 1917). The mountainous agriculture was

introduced along the early flow of pilgrims to Mount Sinai (Dahari, 2000). Nevertheless, the first major economical transition phase took place 1000 years later in mid-14th century CE, mainly characterized by lowland pattern transportation activities, in addition to lowland and highland patterns husbandry economy (i.e. mountainous agriculture 'orchards' and herding) (Shams, 2010a, 2010b, 2011b, 2011c, 2011d, 2011e, 2011f, 2012a, 2012b, 2012c).

It is important to highlight the fact that two waves of inflow Arab tribes migration settled in the vicinity:

- 1 Arab Canaanites in 3rd millennium BCE who settled around the perimeter of the mountain range (i.e. lowland pattern) (Beit-Arieh, 2003)
- 2 Muslim Arab conquest of Egypt in 639-641 CE who partially settled in the northern half of the mountain range and around its perimeter (Shuqier, 1917) (Gohary, 1960) (Ahmed, 2004)

The population ranged between 530-600 individuals during the peak of monasticism in 4th-7th centuries CE (i.e. highland pattern) (Dahari, 2000). The economical activities (i.e. nomadic-based) were subjected to the Sinaitic customary law which recognizes the legal responsibility of the tribe, clan or family, but not on the direct legal responsibility of an individual. Later in 2nd half of 7th century CE, the law was enforced by the monastic community of Mount Sinai—the only permanent direct authority in the mountain range since late classical period—with no major control over the nomads and/or domination on the ownership of land (i.e. historical high judgment court) (Shuqier, 1917) (Ahmed, 2004).

Concurrently till 12th century CE, the Alpine case had undergone two main economical transition phases, witnessing several inflow migration waves and internal migration between different land patterns:

- 1 southern advancement of the Rhaeto-Roman in 220 BCE, characterized by cultural influence and control over the lowland patterns of South Tyrol/Sudtirol (Alto Adige) and Romance Tyrol (Trentino/Trento) (i.e. routes of the central-east cisalpine-transalpine passes 'later Italy-Austria respectively'; Brennero/Brenner '1371m ASL' and Reschen/Resia '1504m ASL')

- 2 northern advancement of the Alemanni/Bavarian (Germanic) in 5th century CE, characterized by the control over the lowland patterns of Tirol (i.e. South Tyrol/Sudtiroil and North Tyrol/Noord Tirol)
- 3 mass establishment of the permanent highland patterns in 1000 CE
- 4 Alemanni/Bavarian (Germanic) expansion on the lowland and highland patterns in Romance Tyrol (Trentino/Trento) in 11th-12th centuries CE

For almost 4000 years, the Alpine socioeconomic and socio-ecological profile developed extensively on the lowland pattern, characterized by the emergence of the mixed-agriculture holdings 'households/farmsteads'—5 to 9 individuals per each—under feudal-based/subsistence economy in 6th-11th centuries CE (i.e. rents-based system: land owners/Nobels and peasants). The households/farmsteads were subjected to the Tyrolese legislations on impartible inheritance of land by the successors of the peasants, in addition to independent peasants control over the production and harvest deposition. In 945-13th/14th centuries CE, it was mass lowland fortification period by the Counts of Tirol, as the number exceeded 100 fortresses mostly concentrated on the routes-passes of the central Alpine ridge. Towns of increasing population and trade accommodation facilities were established along the routes. In 1254 CE, this period was crowned by the unification of Tirol (i.e. lowland and highland patterns), followed by the succession of the Counts of Tyrol by the Habsburg's of Austria in 1363 CE (i.e. North Tyrol/Noord Tirol, South Tyrol/Sudtiroil, East Tyrol/Osttiroil and Romance Tyrol 'Trentino/Trento') (Cole et al., 1999) (South Tyrol Museum of Archeology, 2012).

7.4 The highland consolidation and socio-ecological threats

In 14th century CE, the scale of human occupation development in both the Sinai and Alpine cases were highly variant, providing almost totally different images for two cultural landscapes under relatively similar formation aspects. Regarding the Sinai case, the landscape is a mosaic of mass vicinities of ancient/young volcanic and primary plutonic black-colored rocks (i.e. highly eroded, worn and cracked formation; mature soil of high clay content and relatively deep groundwater table), and young volcanic and plutonic red-colored rocks (i.e. small rock slide, flat surfaces; immature soil made of crumbled

gravel with small amounts of clay and relatively shallow groundwater table). The Bedouins seasonal herding cycle is traditionally organized by grazing on the vegetation of different rock formations at lowland and highland patterns (i.e. long range cycle in the search for natural resources). Meanwhile, the nomads practiced annual mountainous agriculture 'orchards' for six months 'April-October'—palm grooves in low-elevated valleys—mostly located on red rocks, growing 59+ varieties of serials and pulses, seeds, fruits, vegetables, nuts, edible oils and fodder. The mountain range sustained a marginal population, as a single mountainous orchard along with the domestic animals would sustain a household up to six months. The households of the lowland and highland patterns within the mountain range compensated such a shortage via a process of economical interdependency on distant lowland pattern economical activities below 900-950m ASL (i.e. transportation) (Perevolotsky, 1981) (Perevolotsky et al., 1989) (Dahari, 2000) (Shams, 2010a, 2010b, 2011b, 2011c, 2011e, 2011f, 2012a, 2012b, 2012c).

Regarding the Alpine case, the land cover is a mosaic of scattered villages and towns on the lowland pattern; vineyards at 200-500m ASL (i.e. firstly emerged in 500 BCE); orchards and intensive grain cultivation at 200-850m ASL; forest wasteland at 500-700m ASL; orchards and intensive grain cultivation at 200-850m ASL; plowland and meadow 550-1300m ASL; mountain meadow, forest and alm 1100-1800+m ASL. The peasants practiced seasonal cycle of mixed-agriculture (i.e. mountainous husbandry). It was subsistence-based economy which sustained a single household of a relatively medium-sized farmstead/farmhouse—along with the domestic animals—for the entire year. A typical farmstead/household stands for a plowland and a meadow nearby a village, in addition to the right in forestland and mountain pasture for summer grazing (i.e. valley cross-sectional right per village in land resources). Actually, the expansion on the lowland and highland patterns was a reaction for the increasing lowland pattern population (i.e. 240,000 individuals/Tirol in 1312 CE), as more food production was on demand, in addition to new settlement areas (i.e. phase I: early commercialization). Accordingly, permanent highland pattern farmsteads/households emerged on the slopes, transferring the forestland into meadows, plowlands and mountain pasture, and leading to a seasonal short-range local cycle. Those newly emerged farmsteads/households were larger in size in order to compensate with

its low productivity, compared to the lowland ones (Cole et al., 1999) (South Tyrol Museum of Archeology, 2012).

Due to the increasing socioeconomic needs of the naturally growing domestic population and the inflow migration in the Alpine case on one hand, and the scarcity in the available natural resources for a marginal population in the Sinai case on the other hand, both study-areas similarly responded by setting local agreements which regulate the accessibility to common-public natural resources. In mid-14th century-1398 CE, woods and pasture accessibility agreement was in action in the Alps, although it did not block a partial reverse movement to the lowland patterns due to the limited resources of the highland ones (i.e. phase I: first wave) (Cole et al., 1999). During the same period in Sinai, there was a customary agreement in action called *Hilf* in order to regulate the seasonal grazing cycle on different vegetation zones (Shuqier, 1917). Such agreements regulated the shifting socio-ecological relation (i.e. land use) by balancing between the socioeconomic needs and the environmental capacity of the mountain ranges (i.e. natural resources).

7.5 The development, decline and alternatives

Since the medieval consolidation of the highland patterns, identified by main and supportive economical profile(s), the following 350 years economical transition phases (i.e. medieval-mid 20th century CE) were a development matter of the already existing economical activities—rises and declines—due to natural growth and/or internal-external social and/or ethnic conflicts. It was the fact in the Alps, while Sinai stood still on its medieval consolidation (Shams, 2010b, 2011e)! The location of the Alps as a transitional geography of high geopolitical interest and relatively potential environmental capacity, both put constraints on the socioeconomic and socio-ecological options at any period of interest.

In 15th century CE, a mass German labor force inflow migration to South Tyrol took place in the booming and expanding silver/copper mining activities. The Tyrolese population dramatically increased beyond an ecology-based food production-consumption balance (phase II: commercialization in 15th-16th centuries CE). It required legislative incentives on the impartibility of farmsteads/farmhouses in 1404 CE in order to preserve the subsistence-based and early commercial production units, in addition to more regulations on the sale of land by

each commune via a special land commission 'Örtliche Hofekommission'. In 1415 CE, the peasants started to have a representative in the Tyrolean assembly. In 1427 CE, the Tyrolean population reached 360,000 individuals (i.e. 500,000 in 1560; 593,000 in 1754; 719,000 in 1835; 947,000 in 1910 CE). In 16-18th centuries CE, the subsistence-based economy of farmsteads/households failed to sustain the increasing Tyrolean population, causing an outflow migration to Europe, as some worked as roving merchants throughout Europe in 17th-18th centuries CE (Cole et al., 1999).

Although the copper and silver reserves were officially exhausted in 1630 CE, causing less pressure(s) on the farmsteads/farmhouses, the subsistence system failed to recover its socioeconomic position in sustaining the households. At a certain age and according to a traditional inheritance system—not strictly applicable—the possession of land is transferred from the father to the elder son and/or daughter 'legitimate heir', as the rest of the siblings used to leave the farmsteads/household in the search for other socioeconomic alternatives. The ones who moved out kept a level of communication via financial and/or labor force contribution, reflecting their interest in a backup, or they provided no contribution. In early 1600s CE, the lowland pattern meadows and plowland were partially converted to orchards and vineyards. In 2nd half of 18th century CE, the early European industrialization partially received the outflow migration. In 1780 CE, only 46,000 were self-sufficient peasants 'rural', while another 61,000 peasants 'rural' were involved in other economical activities. In 1770-1785 CE, a legislation was issued on the establishment of the Closed Holdings 'Geschlossene Höfe', prohibiting the impartiality of land as a protective measure (Cole et al., 1999).

In 19th-2nd half of 20th centuries CE, nationalism was rising throughout Europe, causing social and ethnic conflicts (i.e. political consolidation and ownership of land), concurrently with rising industrialization and commercialization of agricultural products, in addition to a potential tourism option since 1870-1890 CE (Touriseum, 2012). In 1900 CE, inheritance was liberated in Tirol which provided alternative land use options to the peasants.

There is no doubt that World War I, the global economic depression and World War II caused a series of impacts on land use patterns. The 1st half of 20th century CE was characterized by sharp rises and declines

in the industrialization and commercialization of agricultural products. On one hand, mass tourism highly contributed in the households' income at the Alps post World War II, as many farmsteads/households—including the remote ones—were transferred into refugees and ecolodges for the 20th-21st centuries CE eco-cultural tourists; on the other hand, post the Six Days War in 1967 CE, the High Mountains of Sinai Peninsula joined the tourism-based modern market economy (i.e. first urban center emerged in 1970s-1980s CE). Concurrently, the Alpine case witnessed mass internal migration from highland to lowland patterns, seeking potential employment opportunities in industry and commercial agriculture. The Alpine population showed higher rate of outflow migration due to its higher standard of living and professional skills, compared to the Sinai one where almost the entire marginal population migrated to the lowland pattern (i.e. 4,880 individuals in early 21st century CE) (SEAM, 2003-2004), as the local Bedouins are left with one feasible option exclusively compromised in eco-cultural tourism only.

7.6 Summary

By eliminating the sharp fluctuations in the natural-cyclic Climate Change prior Bronze Age I (3150 BCE) in Sinai and Chalcolithic [Copper Age] (3,500 - 2,300 BCE) in the Alps, in addition to the elimination of the argumentative human-caused Climate Change post 2nd half of 19th century CE, this chapter highlights the fact that the major shifts in land use, and the internal cyclic and/or reverse migration between lowland and highland patterns, besides the outflow migration below 900-950m ASL, all such socioeconomic transitions are due to a gradual rise in the socio-economic production-consumption demands(s) not the natural-cyclic or the human-caused 'anthropogenic' Climate Change. Since the medieval consolidation of the highland pattern in both Sinai and the Alps, the dynamic socio-ecological relation is fulfilling the changing needs and preferences under the constraints of the environmental capacity. The traditional highland pattern was marginalized as considerable food production units 'farmsteads/households' due to an increasing interdependency on the lowland ones; currently, it plays a new potential socioeconomic role as a source eco-cultural/agro-tourism income.

8. Demand for land resources, medicinal plants agriculture cooperative 'MPAC' and government-based business support enterprise 'GBSE'

8.1 Agriculture land ownership and use

Article titled: *Ganzouri agrees on the establishment of cooperative farms in Western Desert*; Dr. Kamal Ganzouri, the Prime Minister approved to start the establishment of the first project of its kind in Egypt, to create four cooperative farms in the "Farafra"-oasis-Western Desert, each farm accommodates 600 families of young newlyweds, and provide 5,000 jobs.¹ This was stated by Dr. Mamdouh Hamza Secretary-General of the National Council of Egypt, after his meeting with Dr. Ganzouri on Sunday, adding that Dr. Ganzouri agreed in principle that the government funding to support construction of housing for families of newlyweds in this cooperative farms, part of the allocation program one million housing units of the Ministry of Housing implementation, and also agreed that the Government digs wells in these farms, a commitment from the state to provide irrigation water, like what is being done in other regions of the Republic. Dr. Mamdouh Hamza has proposed a number of development projects to the Presidency of the Council of Ministers, following the formation of the government of Dr. Ganzouri in December, when the Prime Minister appealed to all loyal citizens to submit their projects progress and proposals to support the government in all areas of development. Hamzah said: "Ganzouri expressed his admiration for the project-Migration to the Inside-which includes motivating and encouraging young people of Egypt to set up collective farms, depending on the method of cooperative economics, as the land remains owned by the state,"² and the young people grow according to the

¹ In a previous attempt 'Ibis resettlement' at Lake Marriot, Beheira Governorate, Western Desert of Egypt, the following issue is highlighted: "Most of the settlers were people at the bottom of the economic structure-those who typically are the most resistant to change." (Dames & Moore, 1979-1985)

² "One of the first and most basic issues in planning human settlements is to determine how the settlers are to earn their livelihood-to what extent will it be from subsistence holdings and to what extent will it be from market production? Once the extent of market production has been decided upon, several decisions must be made:

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principle of "land for those who cultivates it", and the State provides

- i) determination of the size of holding sufficient to provide the settlers with income levels comparable at least to those earned in their original settlements
- ii) selection of the land tenure system to be adopted, as follows:
 - private ownership of land
 - leasing the land to the settlers for a limited time, prior to granting ownership title
 - leasing the land to the settlers for a long time as sharecroppers or under another type of land rental arrangement
 - collective ownership of land
 - state farming, using the settlers as agricultural workers
- iii) determination of the type of supporting organizations to handle farm equipment and supplies, production credit, processing, and marketing and technical guidance
- iv) determination of the degree of assistance to be provided to the settlers with respect to production and marketing
- v) determination of whether the settlers will be required to follow strict technical instructions or will be left on their own with support services available." (Dames & Moore, 1979-1985)

"A word now about the moshav type of village....in concrete terms, this ideal was embodied in (a) national ownership and non-alienation of land, which was considered a value in itself and seen as the basis of a new way of life rather than a marketable commodity; (b) mobilization of special national tasks; (c) public financing (70%), planning and guidance of the settlement, which were considered a condition for accelerated development and growth, and which both symbolized and safeguarded mutual bonds and responsibility; (d) emphasis of manual labor, without the use of hired labor; (e) non-acceptance of gainful employment outside the moshav; and (f) mixed farming, signifying both farm autarky and the all-round farmer's attachment to his homestead via a wide range of ties rather than agricultural specialization which was regarded as the creation of yet another type of commercial enterprise." (Weintraub, 1971)

"What is more, the Labor Movement agreed to cooperate with private capital even in its own bailiwick agricultural settlement. Again it was Berl Katznelson (in 1933) who aptly summed up this turnaround in the attitude toward private capital: When we began, before we grew in numbers and strength, we were afraid of private capital that had nothing but profit in mind. Twenty-five years later, we attained a level that allowed us to take into account working [labor] settlement with private capital as well, either as creator of jobs or as capital seeking an investment and willing to consider even the worker as suitable vehicle." Regarding the "....internal economy....communistic relations are dominant....Relations between 'Ein Harod and other settlements-private settlements and Labor Movement settlements alike-are ordinary relations, like those in any capitalistic economy." (Karlinsky, 2005)

the infrastructure of the collective farms, which contributes to the increase of the agricultural production of Egypt, and to achieve food self-sufficiency (El Shrouk Newspaper, June 3, 2012).

Paradoxically, upon the commencement on writing this chapter, exactly on the same date of the previous article, this is the first governmental initial decision which reflects on productivity *not* service enhancement and support—being the field of focus since the Egyptian National Reforms Revolution of January 25, 2011 CE—in desert and mountain micro-local/municipalities and macro-regional/governorates. Although the geo-focus of the initial decision is the Western Desert of Egypt, it establishes a wider socioeconomic, socio-ecological and governance debate, as the answer is found across the eastern border at the newly born State of Israel–Moshavim—totally a part of the political context, represented in a government developing its thousands of years politically consolidated remote desert and mountain regions/peripheries (i.e. Arab Republic of Egypt), and another (i.e. newly born State of Israel) under a global debate about the *Two State Solution* (i.e. land ownership;³ State of Israel side by side to a Palestinian State on the historical land of Palestine). Based on the Moshavim case-studies in the Negev Desert and the previously discussed experimental farms, since the establishment of a new cooperative, it takes 5-10 years for agriculture production consolidation (Tab. 40)—maximum productivity ‘size/quality’ and the withdrawal of direct technical support⁴—and a minimum of 20 years for social consolidation in terms of the young generations’ education and willingness to preserve the same careers and lifestyle (i.e. the concrete lag under Mubarak’s regime) (Weintraub, 1971) (Gavron, 2000).⁵

³ “The enormous pressure under which the State of Israel labored in matters of security, development and immigrant absorption....thinly inhabited areas waited to be filled, so that the new State’s claim to them should not be disputed, and to achieve population dispersion; numerous new jobs and openings had to be created, and this was considered easier and cheaper in agriculture than in other branches, as social absorption; food and other staples had to be provided for the increasing population.” (Weintraub, 1971)

⁴ The technical support is represented by the disciplinary committees in Katharina municipality which would be permanent according to the organizational blueprint ‘neo municipal governance structure’.

⁵ The only measure to preserve the production units (i.e. agriculture land as the keystone capital) is to apply unproductive households’ withdrawal and

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Table 40 Moshavim ten years consolidation plan: stages, activities and finance (Joint Planning Centre, Weintraub, 1971)

Period	Object of investment and concurrent activities	Source of capital	Percentage of total investment
Before actual settlement	Surveying, planning, water development, area development, roads, buildings (houses), school, armory, office and other communal buildings	Settling authority exclusively	30%
First and second year	Costs of transportation, central irrigation pipes, agricultural equipment, initial provision of revolving capital	Settling authority exclusively	20%
Third year	Construction of other communal buildings and farm sheds, acquisition of stock, planting of orchards and vineyards	Largely settling authority	15%
Fourth to ninth year ⁶	The remaining investment in irrigation, revolving capital, electricity...etc.	Largely settler himself	35% (7%/year)

It must be highlighted that land ownership in the High Mountains of Sinai Peninsula is subjected on one hand to the conclusion in section 3, chapter 6:

Historically and strategically, the complex context of Sinai Peninsula enforced legislative and administrative constraints (e.g. land use and ownership) on the micro-local/municipality and macro-regional/governorate levels, centralizing the planning and decision

replacement: "First of all, it is clear that the withdrawal of families from the common economic organization....affects the financial situation of the collective and reduces its ability to provide public services" (Weintraub, 1971).

⁶ Apart of the young generations future willingness—2nd-3rd generations—the newly introduced agriculture cooperatives would be subjected to the public to private handovers: i) investments (Weintraub, 1971); ii) land privatization and outsourcing (Gavron, 2000), as the willingness issue is partially solved to a certain extent by the introduction of customized agriculture education (Weintraub, 1971).

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making process in Cairo and subjecting it to security-based veto (Shams, 2011e)

On the other hand, the land status in the article–Western Desert–differs from the High Mountains of Sinai Peninsula in a core principal: the mountain range socio-ecologically rose, consolidated, developed and declined, and concurrently under revival debate in terms of socioeconomic and socio-ecological feasibility, based on private traditional land use;⁷ while the cooperative farms in the article *vis-à-vis* the Moshavim in its socioeconomic and socio-ecological context (i.e. newly introduced Middle Eastern community to remote lands owned by the State, as the State provides the infrastructure in order to support cooperative agricultural production for market economy) (El-Nasharty, Sinai Encyclopedia, 1960) (Weintraub, 1971) (Gavron, 2000).⁸ In practice, the High Mountains of Sinai Peninsula is subjected to the driving forces of demand for land resources shown in table 41.

Several sets of DIAMONT instruments for land resources management are identified:

Laws and regulations: for the case of DIAMONT, predominantly laws that affect the regional and local level have been collected. The framework for concrete spatial planning on local and regional level;

Spatial planning: regulate the type of land use on various spatial levels;

Economic instruments: try to support desirable behavior by economically subsidizing desirable and sanctioning undesirable behavior in regard to sustainable development;

⁷ The Medicinal Plants Agriculture Cooperative (i.e. proposed name: Mount Sinai Agriculture Cooperative) would serve one element of the rising supportive economical activity (i.e. part-time household work load): “One possibility now being studied is, in fact, the so-called “combined farm” which includes agriculture and outside employment in regional or cottage industries, specially established for this purpose. This form has been proposed chiefly for the mountain area, to meet special problems of scarcity of land on one hand, and lack of employment on the other hand.” (Weintraub, 1971); this is typical of the High Mountains of Sinai Peninsula, but on private ownership basis for the agricultural orchards and plots (i.e. traditional land use).

⁸ No published information is available about the organizational structure of the article’s proposed cooperative farms.

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Voluntary approaches and agreement/Cooperation: bottom-up approaches try to achieve certain development goals by voluntary action and agreements between different interest groups while abstaining from state regulations and laws;⁹

Information research: this approach aims at improving information and public awareness about development issues (DIAMONT, 2008c).

Table 41 DIAMONT-based driving forces of demand for land resources (e.g. orchards and plots) (DIAMONT, 2008c) in the High Mountains of Sinai Peninsula

Driving Forces of Demand for Land Resources	Lowland Pattern 'Accessible'	Lowland and Highland Patterns 'Inaccessible'	Lowland Pattern 'Accessible'	Lowland and Highland Patterns 'Inaccessible'
Status	Present		Future <i>Phase I: semi-decentralization '5-10 years': education and socioeconomic leverage (estimate: post medicinal plants mass production)</i>	
Land-intensive house types	x	x	x	x
Land-intensive commercial, recreation and tourism installations	√ (Hotels)	√ (Ecolodges; local initiative)	x (Prohibition recommended)	√ (Ecolodges; local initiative)
Economic purposes	√ (Multi-purpose, including agriculture)	x (Very low profile)	√ (Multi-purpose, including agriculture)	√ (Mountainous orchards revival)
Municipal land policies	≈ (Out of	≈ (Out of	√	√

⁹ A higher attention should be given to the inter-institutional and inter-group(s) of interest voluntary actions in order to deduce costs and catalyze the sustainable development process.

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	action)	action)		
Bias of local decision-makers (i.e. lobbying of traditional land users)	√	√ (With exception to high inflow investment-s)	x (Traditional consolidation + inflow investments on unconsolidated lands)	≈ (Low environmental capacity and lack of knowledge of any inflow migration 'traditional consolidation')
Municipal financing	x	x	√ (GBSE)	√ (GBSE)
Promotion of owner-occupied housing	x	x	----	----
Policies of home loan banks	x	x	√	x
Focus on planning instruments of growth and expansion	x	x	√ (Multi-aspect natural growth rate of current population)	√ (Expansion in medicinal plants production Vs. ecolodges 'water issue')
Land price gradient	≈ (Low profile)	x	√ (Relatively higher profile)	√ (Emergence)
Tax cuts for commuters	x	x	x	x
Land efficiency Vs. means of public transport	x	x	x	x
Traffic volumes	√ (Tourism)	x	√ (Tourism +	x

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			Logistics)	
Increasing welfare	√ (Relatively low/medium standard of living)	x	√ (Relatively low/medium standard of living) ¹⁰	√ (Relatively low/medium standard of living)
Individual housing demand	√	x	√	≈
Valuation of amenities	≈ (Relative)	√	√	≈ (Negative aesthetic landscape impact of Closed System Agriculture) (Fig. 84) ¹¹
Number of persons per household size	√	x	√	≈ (Medicinal plants Mountainous orchards act as an improvement factor)

¹⁰ Significant enhancement of social services with relatively low household income increase during phase I: semi-decentralization '5-10 years': education and socioeconomic leverage; potential income increase is estimated upon phase II: micro-local financial resources decentralization 'full democratization'.

¹¹ The proposed future introduction of the medicinal plants mass production to the remote mountainous orchards of the High Mountains of Sinai Peninsula–Middle East–due to the economic infeasibility of the traditional-current fruit production is equivalent to the concurrent introduction of the strawberries mass production to the meadows of Alto Adige/South Tyrol at ValVenosta/Vinschgau-Alps–due to the economic infeasibility of the traditional dairy production, negatively impacting landscape aesthetics and eco-cultural tourism by imposing Closed System Agriculture on the green fields (Nikolaus Obojes Oral Communication, EURAC/Alp-Env, June 4, 2012).



(2012 CE)

Figure 84 Val di Mazia/Matscher; negative cultural landscape impact of the newly introduced berries cultivation to the Alpine meadows [Muhlhof 1469m ASL] (Val Venosta/Vinschgau, ‘Alto Adige/Südtirol’ province) – May 29, 2012: SinaiAlps Project 2011-2012 CE’

As a result of the micro-local/municipality level focus of the study-research, and the production aspects focus of this chapter, table 42 reviews the implementation of the economic instruments on the micro-local/municipality level (i.e. neo municipal governance structure) in the High Mountains of Sinai Peninsula.

Table 42 Economic instruments for land resources management on micro-local/municipality level (DIAMONT, 2008c) in the High Mountains of Sinai Peninsula

Name of Economic Instrument	Lowland Pattern ‘Accessible’	Lowland and Highland Patterns ‘Inaccessible’	Lowland Pattern ‘Accessible’	Lowland and Highland Patterns ‘Inaccessible’
General Economic Instruments	Present		Future <i>Phase I: semi-decentralization ‘5-10 years’: education and socioeconomic leverage</i> (estimate: post medicinal plants mass production)	

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Access fee/supply fees <i>Fees that accrue for access to public infrastructure and services</i>	x	x	√ (e.g. To be applied to the for-profit/commercial sector)	√ (e.g. Irrigation systems) (Fig. 85) ¹²
Consumptive fees <i>Fees taking into account the actual consumption of a collective good</i>	x	x	√	√ (e.g. Pasture land and medicinal plants collection) ¹³
Steering Taxes <i>Tax level taking into account the costs and benefits of activities on society as a whole</i>	x	x	√ (e.g. Tourism)	√ (e.g. Tourism)
Subsidies and local business development <i>Direct financial aid but also indirect aid through e.g. waive of fees for special user groups</i>	√ (External grants)	√ (External grants)	√ (GBSE + external grants)	√ (GBSE + external grants)
Liabilities <i>Municipal, federal state or national state liabilities for property damages</i>	x	x	√ (Requirement: Regulations /	√ (Requirement: Regulations /

¹² Fee exemption is to be applied until predetermined stable size of production is achieved (i.e. runoff quotas).

¹³ To be deducted as marketing fees; alternatively, the collection zone(s) per household(s) are to be set according to a customary agreement with specified monetary penalties for any violation (i.e. check footnote 5) (Bauer, 2003), as the Medicinal Plants Conservation Project achieved limited progress in such a direction due to the refusal of the Bedouin elders to the traditional land use map which grants constrained access for household/tribal quarters to certain zones (MPCP Newsletter).

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<i>and personal injuries accruing as a result of natural hazards, emission loads, traffic etc.</i>			legal code)	legal code)
Creation of markets/ regional marketing <i>Legal and institutional framework for trademark protection of certain production standards, tradable land use permits</i>	√ (Limited application: Medicinal Plants Conservation Project + FANSINA handicrafts)	x	√	√ (i.e. Create Highland/Rural Bedouin Support/BIO Trademark)

8.2 Case-study: Val Venosta-Vinschgau agriculture cooperatives association

Under this context, the Medicinal Plants Agriculture Cooperative 'MPAC' meant for the High Mountains of Sinai Peninsula *vis-à-vis* the ones of Alto Adige/South Tyrol, ValVenosta-Vinschgau Agriculture Cooperative, defined by the following criteria:

- 1 private land ownership or traditional land use 'human occupation development' (i.e. mountainous orchards)
- 2 private water resources intake out of common source (i.e. semi-arid watersheds)¹⁴

¹⁴ High potentiality of social conflict upon the succession in establishing an economically feasible medicinal plants production in remote mountainous areas, characterized by the scarcity of water resources and the lack of watershed management plan under mass production system; it requires a watershed management plan based on private intake out of common source proportional to the size of the consolidated orchards in terms of production

- 3 cooperative production for market economy
- 4 centralized sales (i.e. retail price), marketing, quality control, administration and organic produce
- 5 decentralized costs
- 6 initial production-based membership fee (i.e. 10% base and 90% share)¹⁵
- 7 production-based profit shares for members
- 8 board of directors 'five years elections'
- 9 micro-local/municipality agriculture technical support
- 10 external technical and financial support (i.e. EU 'up to 50%' and PGI 'up to 80%' funds, both subjected to provincial government pre-financing)¹⁶
- 11 annual financial liquidation (ValVenosta-Vinschgau, 2102)
- 12 Government-based Business Support Enterprise (i.e. relatively does not imply to ValVenosta-Vinschgau Agriculture Cooperatives Association) (Scottish Government Highlands and Islands Enterprise 'HIE', 2012) (Tab. 43).

8.3 Government-based business support enterprise 'GBSE'

The priorities of the Highlands and Islands Enterprise 'HIE': i) supporting businesses and social enterprises to shape and realize their growth aspirations; ii) strengthening communities and fragile areas; iii) developing growth sectors (i.e. business services; creative Industries 'advertising, architecture, art and antiques, crafts, design,

capacity (Nikolaus Obojes Oral Communication, EURAC/Alp-Env, June 4, 2012).

¹⁵ Only the 10% base of the membership fee is refundable in case of a member quits the ValVenosta-Vinschgau Agriculture Cooperatives Association.

¹⁶ The provincial government of Alto Adige/South Tyrol pre-finances the approved EU and PGI agriculture support funds, enabling the farmers to benefit 1-2 years early funds accessibility in order to boost the production process and put the agriculture sector a step ahead its EU/regional competitors.



(2012 CE)

Figure 85 Val di Mazia/Matscher traditional mountainous irrigation system [Lochhof 1400m ASL] (Val Venosta/Vinschgau, 'Alto Adige/Südtirol' province) – May 29, 2012: SinaiAlps Project 2011-2012 CE'

Table 43 Factsheet of ValVenosta-Vinschgau Agriculture Cooperatives Association¹⁷

Aspect	ValVenosta-Vinschgau
Microclimate	<ul style="list-style-type: none"> - 200-300 days of sun/year; precipitation < 500mm; average daily temperature variation ranges between 2-3°C to 20-25°C - Benefits: natural sugar; crunchy; juicy; slowed down ripening process; minimal use of pesticides
Protected Geographical Indication 'PGI'	Product quality is typical to the area of origin (i.e. traditional cultivation methods, without disdaining the support of modern technologies)
Certifications	EUREP/GAP: strict quality control on fruits and vegetables cultivation; GlobalGAP: production control/Environment; IFS: cooperatives transformation quality; ISO 14001:2004: environment; ISO 9001:2000: process quality (i.e. cultivation, harvest, delivery, conservation, storage, opening the cells, selection, ordering, packing and delivery); in addition to Council

¹⁷ (Michael Grasser Oral Communication, Marketing Manager of ValVenosta-Vinschgau Agriculture Cooperatives Association, Spring 2012).

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	Regulation (EC) No. 834/2007: organic production under the guidelines of Bioland or Demeter; Protected Geographical Indication 'EU-PGI': high quality traditional cultivation (i.e. cultural landscape)
Cooperatives	The ValVenosta-Vinschgau Agriculture Cooperatives Association is composed of seven cooperatives out of nine in the valley: i) TEXEL in Naturno/Naturns; ii) JUVAL in Castebello/Kastelbell-Tschars; iii) MIVOR in Laces/Latsch; iv) MEG in Martello/Martell; v) GEOS in Silandro/Schlanders; vi) ALPE in Lasa/Laas; vii) OVEG in Oris/Eyrs
Local Farmers ¹⁸	1,750 out of 2,000 in ValVenosta/Vinschgau (i.e. fruits mass production since 1940s-1950s CE)
Farms' Area	5,110 hectares at an elevation of 500-1100m ASL for fruits, 900-1600m ASL for vegetables and 900-1800 for berries ¹⁹
Technology	Irrigation installations (i.e. once, 10mm/week), ²⁰ antifreeze sprinkling system, neo cultivation methods (e.g. integrated production: ladybirds Vs pests), and organic cultivation

Agriculture products 'traditional hand based harvest'

	Variety	Origin	Season
Apples (Fig. 86)	GOLDEN	United States	Mid-October
	DELICIOUS ²¹	1890	to July
	JONAGOLD	United States	Mid-October
	RED DELICIOUS	1953	to June
		United States	October to

¹⁸ According to Weintraub, nine different sets of relations are discussed between manpower Vs. farming requirements (i.e. less '0-1', equal '1.5-2', and more '2.5-more') and no. of consumers Vs. earning potentials (i.e. fewer '1-3', matched '4-5', and greater '6+'), as more/fewer is the optimum (Weintraub, 1971). In the case of the High Mountains of Sinai Peninsula, the household-based medicinal plants orchard would be tended by 1-2 members, being the rising supportive economy during phase I (i.e. semi-decentralization '5-10 years': education and socioeconomic leverage phase).

¹⁹ A 4-5 hectares–60 t/ha–apple farm economically sustains a household.

²⁰ Currently, dripping systems are being installed due to the decline of water resources (Michael Grasser Oral Communication, Marketing Manager of ValVenosta-Vinschgau Agriculture Cooperatives Association, Spring 2012).

²¹ Golden Delicious contributes by 66% of the total apple production, facing high competitiveness of other varieties.

Demand for land resources

	GALA	1861 New Zealand	March September to March
	BRAEBURN	1960 New Zealand	November to March
	PINOVA	1952 Germany	November to May
	FUJI	1939 Japan	October to mid-May
	IDARED	1942	December to May
	ELSTAR	1955 Netherlands	September to March
	TOPAZ	1982 Czech Republic	November to April
	GLOSTER	1951 Germany	December to April
	Variety		Season
Berries	Strawberries		June to October
	Raspberries		July to October
	Red Currant		July to September
	Black Currant		July to August
	Blackberries/Blueberries		----

Annual Production 'in addition to apricots, pears and other fruits'

Apples	362,595 tons
Vegetables	2,768 tons (i.e. cauliflower, iceberg lettuce, radicchio and cabbages) in June-October
Berries	763 tons
Storage Capacity	300,000 tons
Grading Capacity/hr.	140 tons (i.e. size, color and quality 'weight/shape')
Packing Capacity/hr.	200 tons (i.e. sealed bags, bags, foodtrainer 4-fruits, foodtrainer 6-fruits, foodtrainer 8-fruits, baby poker cardboard box '2 sizes', cardboard box '2 sizes', plateau, Euro cardboard box, maxpac box and reusable plastic carte '2 sizes'.
Markets ²²	46; mainly, Italy '50%', Germany '14%', Scandinavia,

²² No solid data is available about the Katharina municipality share in the medicinal plants market, amounting to an estimate of 5-40 tons of unprocessed

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	Spain, and the Mediterranean
Turnover ²³	225 million Euros
Threats	Decline in consumption; competitiveness of the current varieties; low cost production; copying of ValVenosta/Vinschgau by developing countries; water resources in 40 years

designer fashion, film, interactive leisure software, music, performing arts, publishing, software and computer services, television and radio; energy; food and drink; life sciences; sustainable tourism; universities), particularly distinctive regional opportunities; iv) creating the conditions for a competitive and low-carbon region....*Business Services* has had a positive impact on the region's economic growth and stability as a result of collaborative working between public and private sectors. HIE has forged a productive, proactive and forward-thinking relationship with business services providers....HIE not only recognizes the strong regional contribution of the business services sectors, but also its considerable future potential, given continuous investment. This commitment goes beyond conventional incentives such as providing property, financial and workforce development assistance for businesses relocating to or launching in the area. We also make on-going investments in strategic industry development, in product and market research and in running innovative pilot projects with interested parties (Business Services, Scottish Government Highlands and Islands Enterprise 'HIE', 2012).

It is expected that the Government-based Business Support Enterprise 'GBSE' would play a key role in the High Mountains of Sinai Peninsula as a micro-local/municipal department under a macro-regional/governorate headquarter, enabling the following:

- 1 advertising and promoting investment opportunities and local partnership within the mountain range in collaboration with the disciplinary committees

dry material (i.e. 300 herbal medicine are sold in the Egyptian market; pharmaceutical companies: Sekem, Kato Aromatic and El Baquley; price: 19,000 USD/ton³, amounting to 1,100 USD/ton/common species) and 10 tons of processed ones (i.e. micro-local/municipality 'Katharina' market); cultivation revenue: 5,000-13,290 USD/Nile Valley hectare (UNDP, 2002).

²³ Currently, the Medicinal Plants Association pays 35 Egyptian Pounds 'EGP'/1 kg with a retail price of 140 EGP (i.e. 7 EGP/50 gr. Packs) (MPCP Newsletter).



(2012 CE)

Figure 86 Ponte Adige/Sigmundskron apple farms [Castle Firmiano/Schloss Sigmundskron 270m ASL] (Fossa di Adige/Etschgraben, 'Alto Adige/Südtirol' province) – October 30, 2011: SinaiAlps Project 2011-2012 CE'

- 2 government-based grants allocation for Small and Medium Enterprises 'SMEs'²⁴
- 3 national-domestic/international grants acquirement for micro-local/municipal development activities (i.e. currently legal by the central government only)²⁵

Currently due to the Decree-law No. 14 of 2012 on the Integrated Development in Sinai Peninsula and total instable legislative and political situation in the Arab Republic of Egypt, it is infeasible to discuss further details about the GBSE

²⁴ There is a need for a customized capacity/geo-based definition for the Small and Medium Enterprises 'SMEs' in urban-rural desert/mountain areas.

²⁵ Task (1) would be executed during phase I (i.e. semi-decentralization '5-10 years': education and socioeconomic leverage phase), while tasks (2) and (3) depends on proceeding to phase II (i.e. micro-local financial resources decentralization 'full democratization').

8.4 Conclusion

As a result of Mubarak's regime failure in executing the strategic development plans and the high infeasibility of the medium-term ones on different levels—with limited and partial exception to the sub-Nile Valley ones—the remote desert and mountain land resources of the Arab Republic of Egypt were locally-regionally alienated or transacted as marketable commodity, subjected to polarized domestic-national/international investments. The agricultural cooperatives as a solid option for an economically feasible national/international market share for the low-medium productive desert and mountain lands are highly marginalized within the national budget, along with the governmental business support for the SMEs. The proposed MPAC 'private' and GBSE 'public' would boost the household income by supporting the rising supportive economical activities and local-micro/municipal economy. The MPAC potentially improves and integrates with the Medicinal Plants Association 'MPA' and the holding Medicinal Plants Conservation Project 'MPCP' (Tab. 15 & 17).

Article titled: *Equator Prize Winners Announced, Awards will be Presented During Rio+20*; UNDP supports the Equator Initiative, a partnership that brings together the UN, governments, civil society, businesses and grassroots organizations to advance local sustainable development solutions for people, nature and resilient communities. The Equator Initiative announced yesterday the names of twenty-five local community groups to receive the Equator Prize 2012 in recognition of their outstanding contributions to sustainable development. The winners were selected from 812 nominations submitted by communities in 113 countries across the developing world. The winners will be celebrated at a high level event during the Rio+20 UN Conference on Sustainable Development. They will receive a monetary award and participate in a 'community summit' that will run in parallel to the larger conference. "We wanted to make this a truly global award, so expanded eligibility to all countries receiving support from UNDP. The overwhelming response from 113 countries in 13 languages tells us there is a world of community-based innovation out there, and that demand for a better future transcends borders," said UNDP Administrator Helen Clark. "These community efforts are heroic and inspiring. And that is what the Equator Prize is all about—shining a spotlight on the women and men on the front lines of sustainable development. At UNDP, we are so deeply proud of leading this initiative and giving communities a voice." Many of the foundational issues to be discussed at the landmark Rio+20

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Conference are represented in the pool of winners: food security, sustainable jobs, freshwater access, sustainable energy, oceans, and more. The Equator Initiative is a partnership that brings together the UN, governments, civil society, businesses and grassroots organizations to advance local sustainable development solutions for people, nature and resilient communities....Equator Prize 2012 Winners....Middle East and North Africa....Medicinal Plants Association in Egypt cultivates medicinal plants in the Saint Catherine Reserve in Sinai, creating sustainable income-generating opportunities for the area's Bedouin population (Press Release 'PRWEB', March 23, 2012).

9. Sinaitic reflections: a contextual review

9.1 Himalayan reflections on the Sinaitic context

The ethos behind the contextual review is to conclude the core aspects of the High Mountains of Sinai Peninsula via reflections from the Upper Mustang valley in the Nepali Himalayas, indicating the common issues of interest. It is a domestic and global setting review.

9.1.1 The question of trans-border development relevant to military infrastructure

A negative opinion of the nomadic existence is common in sedentary agricultural societies, whose members see nomads as shiftless and difficult to control....The logic behind state projects of modernization was to consolidate the power of central institutions and diminish the autonomy of communities *vis-à-vis* those institutions (Bauer, 2004).

For pastoral peoples, the critical fact of modern times is the rise of the state and its consolidation of control through military means (Philip Salzman, 1980; Bauer, 2004).

As the Chinese built roads across the plateau, the needs of Tibetans and local economic development were secondary concerns to supplying the People's Liberation Army (Bauer, 2004) (Tab. 44).

Sinai has stood still for hundreds of years while changes and development took place around it. It has now started to move....How quickly can the peninsula be transformed to accommodate a population of one million or more?....Many plans for the full development of Sinai have been discussed. For centuries plans were formulated more in terms of military or security considerations than in terms of development and settlement (Dames & Moore, 1979-1985).

Table 44 Socioeconomic timeline of Upper Mustang 'Theme: Rangelands = Maps' (Bauer, 2004; other references specified)

Date	Socioeconomic Condition
406 CE	- <u>Political consolidation/administration:</u> early Sino-Nepal relations
6 th -8 th centuries CE	- <u>Political consolidation/administration:</u> Yarlung the 1 st Tibetan Dynasty

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	<p>concurrent the ancient Kingdom of Zhangzhung of the Western Tibet</p> <p><i>Upper Mustang economy</i></p> <ul style="list-style-type: none"> - <u>Feudalism/subsistence</u>: land owners/ Nobels and monks Vs peasants (i.e. debts/rents-based system)
8 th century CE (UNDP, 2006)	<ul style="list-style-type: none"> - <u>Fortification/monasticism</u>: Lo Gaykar
842 - 14 th century CE	<ul style="list-style-type: none"> - <u>Political consolidation/administration</u>: fall of Yarlung Tibetan Dynasty and the formation of smaller kingdoms <p><u>Medieval Upper Mustang economical transition phase</u></p> <p><i>Main economy (rise)</i></p> <p><i>'Low and Highland pattern'</i></p> <ul style="list-style-type: none"> - <u>Transportation</u>: highland Indo-Tibetan economic activity; trade via Nepal (i.e. jewelry, clothing, household goods, ritual objects, grains, salt, musk, medicinal plants, precious stones, sugar, Indian tea, metal utensils, tobacco, matches, wool and livestock); winter in Hindu-Nepal 'grain source' and summer in Budi-Tibet 'salt source' - <u>Trade/pilgrimage accommodation facility</u>: traditional tea houses - <u>Mountainous husbandry</u>: low and highland patterns <p>Tasks: controlling grazing, protecting the herd, assisting births, rearing calves, milking cows, processing dairy products, harvesting wool, spinning thread and constantly collecting fuel</p> <p>Livestock: yak, cattle, yak-cattle crossbreeds, goats, sheep horses, chicken and pigs</p> <p>Dairy products 'March-October': butter, buttermilk, yogurt, creamy yogurt, cottage cheese, dry hard cheese 'Churpi'</p> <p>Spring 'fourth Tibetan month': plow animals are brought back from winter</p>
1000 CE	

pastures in Hindu-Nepal; animal breeding; maintenance of irrigation canals; agriculture land is fertilized by ashes, cheep dung, night soil and kitchen midden (i.e. 4-7 months annual food supply: barley and potatoes); movement towards summer pastures at 4,000-5,000m ASL; annual trip to Tibet (i.e. amount of precipitation indicates the quality of pasture)

Early Summer 'seventh Tibetan month': peak of dairy production (i.e. equivalent to the later handicrafts)

Summer: pasture and trade in Budi-Tibet

Late Summer-Early Winter 'ninth-tenth Tibetan month': cull of male animals 'cold/dry weather', harvest time and livestock handover to the Tibetans for winter pasture

Early Winter 'tenth-twelfth Tibetan month': dung collection after June-September rainfall

Winter: pasture and trade in Hindu-Nepal 'middle-hill'

Supportive economy

'Highland pattern' (constant)

- Weaving: clothing, ropes, blankets and tents made out of wool in June-July (i.e. local consumption and trade)

- Administration: Trans-Himalaya family-based trade agreement '*Netsang*'

- Administration: vegetation agreement in action (i.e. prevent open access to communal rangelands and reinforce property lines)

- Law: establishment of the Closed Holdings, characterized by Impartiality

- Political consolidation/administration: establishment of the Kingdom of Lo by Ame Pal of Tibetan Ngari, based in the capital Lo Monthang

1380 CE

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	<ul style="list-style-type: none"> - <u>Feudalism/subsistence</u>: taxes, labor and religious services as Lo's tributes - <u>Fortification/monasticism</u>: Tirigaon monastery; Ghilunqpa Khola temple; Gurung temple; Tangbe monastery; Gumbakang monastery; Chhusang monastery; Tetang monasteries; Mani Wall; Chele monastery; Chhuyer monastery; Syanboche/Shyangbochen monasteries; Chiling/Geling monasteries; Chhunggar monastery; Ghami/Ghemi monasteries; Ghar Gumba monastery; Dokpolo Khola monastery; Chhorak Dokpa Khola monastery; Chhorak monastery; Namgyal monastery; Phuwa monasteries; Thinggar monasteries; Nenyul monastery; Kimaling monastery; Lhaktung Dovan monastery; Arka monastery; Arka/Kimaling monastery; Sisa monastery; Dhuk monasteries; Dhuk/Garphu monastery; Garphu/Ghom monastery; Yachebu monastery; Jhong monastery; Nyamdo/Nhichung monastery; Bharma upstream monastery; Ghoktang monastery; Gamaar monastery; Sam Dzong monastery; Chhuchhu Gumba monastery; Sungda Chhorten monastery; Dhigaon monastery; Yara monastery; Gharagoan; Luri Gumba monastery; Chrang/Tsarang monasteries; Tange monastery; Thati temple

1446 CE (UNDP, 2006)	<ul style="list-style-type: none"> - <u>Fortification/monasticism</u>: Jhampa Gompa in Lo Manthang
1472 CE (UNDP, 2006)	<ul style="list-style-type: none"> - <u>Fortification/monasticism</u>: Thupchen Gompa in Lo Manthang
Mid 1700s CE	<ul style="list-style-type: none"> - <u>Political consolidation/administration</u>: Gorkha tribes under the leadership of Prithvi Narayan Shah
1750-1950 CE	<ul style="list-style-type: none"> - <u>Political consolidation/administration</u>: modern nation-state emergence
1769 CE	<ul style="list-style-type: none"> - <u>Political consolidation/administration</u>: Gorkha tribes seized Kathmandu

1789 CE	- <u>Political consolidation/administration</u> : Gorkha tribes subsumed Kingdom of Lo with administrative powers
1788 CE	- <u>Political consolidation/administration</u> : Gorkha tribes first invasion into Tibet under the support of anti-Lhasa forces and withdrawal based on tributes paid by the Tibetan government 'Lhasa' to Kathmandu
1791 CE	- <u>Political consolidation/administration</u> : Gorkha tribes second invasion for Tibet and withdrawal under the pressure of Qing's forces 'emperor of China'; the invasion of Nepal and the surrender of Gorkha tribes based on tributes to China every 5 years
1792 CE	- <u>Peace Agreement</u> : between Nepal-China, strengthening the Chinese political powers over Tibet-Lhasa while raising initial suzerain claims over Nepal
1800s CE	- <u>Political consolidation/administration</u> : rise of the British colonial power in India; continuation of the tributes by Gorkha tribes to China every 5 years (e.g. opium)
1846 CE	- <u>Political consolidation/administration</u> : establishment of of Rana Oligarchy by Jung Bahadur Kunwar Rana post the royal Kot Massacre and Nepal's partial political isolation
1850s-1950s CE	- <u>Trade</u> : manipulation by the British Raj
1854 CE	- <u>Political consolidation/administration</u> : Nepal's Hindu-based identity
1856 CE	- <u>Political consolidation/administration</u> : Gorkha tribes third invasion for Tibet and withdrawal based on annual tributes paid by the Tibetan government 'Lhasa' to Kathmandu, in addition to extraterritorial trade rights (i.e. Nepalese duty-free status in Tibet)
1860s CE	- <u>Political consolidation/administration</u> :

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<p>1860s-1877 CE</p>	<p>Nepal's Trans-Himalaya cross-power balance between China and India</p> <ul style="list-style-type: none"> - <u>Trade</u>: eastern trade route of India-Tibet-China by the British Raj Vs western trade route of India-Nepal-Tibet-China - <u>Political consolidation/administration</u>: the British McMahon Trans-Himalaya borderline (i.e. Nepal, India and China); Mustang's traditional autonomy based on local taxes paid to the Nepalese crown
<p>19th-20th centuries CE</p>	<ul style="list-style-type: none"> - <u>Political consolidation/administration</u>: fall of Rana Oligarchy; Mustang's anti-Communist guerilla groups against China in Tibet <p style="text-align: center;"><u>Modern Upper Mustang economical transition phase</u></p>
<p>1950s CE</p>	<p style="text-align: center;"><i>Main economy</i></p> <p style="text-align: center;"><i>'Low and High land pattern' (decline)</i></p> <ul style="list-style-type: none"> - <u>Transportation</u>: highland Indo-Tibetan economic activity; trade via Nepal (i.e. jewelry, clothing, household goods, ritual objects, grains, salt, musk, medicinal plants, precious stones, sugar, Indian tea, metal utensils, tobacco, matches, wool and livestock); winter in Hindu-Nepal 'grain source' and summer in Budi-Tibet 'salt source' - <u>Trade/pilgrimage accommodation facility</u>: traditional tea houses - <u>Mountainous husbandry</u>: low and highland patterns <p>Tasks: controlling grazing, protecting the herd, assisting births, rearing calves, milking cows, processing dairy products, harvesting wool, spinning thread and constantly collecting fuel</p> <p>Livestock: yak, cattle, yak-cattle crossbreeds, goats, sheep horses, chicken and pigs</p> <p>Dairy products 'March-October': butter, buttermilk, yogurt, creamy yogurt,</p>

	<p>cottage cheese, dry hard cheese 'Churpi'</p> <p>Spring 'fourth Tibetan month': plow animals are brought back from winter pastures in Hindu-Nepal; animal breeding; maintenance of irrigation canals; agriculture land is fertilized by ashes, cheep dung, night soil and kitchen midden (i.e. 4-7 months annual food supply: barley and potatoes); movement towards summer pastures at 4,000-5,000m ASL (i.e. amount of precipitation indicates the quality of pasture)</p> <p>Early Summer 'seventh Tibetan month': peak of dairy production (i.e. equivalent to the later handicrafts)</p> <p>Summer: pasture and trade in Budi-Tibet</p> <p>Late Summer-Early Winter 'ninth-tenth Tibetan month': cull of male animals 'cold/dry weather', harvest time and livestock handover to the Tibetans for winter pasture</p> <p>Early Winter 'tenth-twelfth Tibetan month': dung collection after June-September rainfall</p> <p>Winter: pasture and trade in Hindu-Nepal 'middle-hill'</p> <p>- <u>Wage labor:</u> Tibetan refugees as herdsmen in Mustang</p>
	<p><i>Supportive economy</i></p> <p>'Highland pattern' (constant)</p> <p>- <u>Weaving:</u> clothing, ropes, blankets and tents made out of wool in June-July (i.e. local consumption and trade)</p> <p>- <u>Environmental threat:</u> overgrazing on Upper Mustang's summer pastures due to the loss of access to the Tibetan ones</p>
1951 CE	<p>- <u>Political Agreement:</u> Seventeen Points Agreement between communist China and feudal Tibet</p>
1954 CE	<p>- <u>Political Agreement:</u> Five Principles Agreement between independent India</p>

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	<p>'1947 CE' and communist China, reinforcing China's control over Tibet (i.e. Chinese-Tibetan sovereignty) and India's control over Sub-Himalaya</p>
1955-September 20, 1956 CE	<ul style="list-style-type: none"> - <u>Political Agreement</u>: Nepal-China Tibetan Trade Agreement, reinforcing China's control over Tibet (i.e. Chinese-Tibetan sovereignty) and India's control over Sub-Himalaya (i.e. Sino-Nepalese equal sovereignty)
1959 CE	<ul style="list-style-type: none"> - <u>Political consolidation/administration</u>: Tibet's uprising; Upper Mustang's anti-Communist guerilla groups against China in Tibet (i.e. Khampa) - <u>Administration</u>: restriction of access to Upper Mustang - <u>Migration</u>: flow of Tibetan refugees across the Himalayas to the south towards Nepal and India
1959-1963 CE	<p style="text-align: center;"><i>Main economy</i> <i>'Lowland pattern' (rise)</i></p> <ul style="list-style-type: none"> - <u>Transportation</u>: Indian salt replaces the shortage in the Tibetan one
1960s CE	<ul style="list-style-type: none"> - <u>Political consolidation/administration</u>: China's borderline identification outposts policy along China 'Tibet'-Nepal-India
1961-1974 CE	<ul style="list-style-type: none"> - <u>Political consolidation/administration</u>: intelligence and logistical support by the United States and India for the anti-Communist guerilla groups against China in Tibet (i.e. Khampa), operating from Upper Mustang
June 1960 CE	<ul style="list-style-type: none"> - <u>Political consolidation/administration</u>: fire engagement between Nepal's frontier guards and the Chinese troops in Upper Mustang's demilitarized zone
October 1961 CE	<ul style="list-style-type: none"> - <u>Political agreement</u>: Sino-Nepal Boundary Agreement
December 1961 CE	<ul style="list-style-type: none"> - <u>Political consolidation/administration</u>: King Mahendra control over Nepal via a

	bloodless coup
1962 CE	<ul style="list-style-type: none"> - <u>Political agreement</u>: Sino-Indian Boundary Agreement - <u>Political agreement</u>: China 'Tibet'-Nepal Boundary Agreement - <u>Political consolidation/administration</u>: declaration of Tibet Autonomous Region 'TAR'
January 20, 1963 CE	<p><i>Main economy</i> <i>'Highland pattern' (decline)</i></p> <ul style="list-style-type: none"> - <u>Transportation</u>: 30km both sides traditional trade across Nepal-TAR borderline; the subsidized Trans-Himalayan fixed-prices prevails over the Sub-Himalayan ones
1963 CE	<ul style="list-style-type: none"> - <u>Migration</u>: US support for Tibetans in exile
1964 CE	<ul style="list-style-type: none"> - <u>Administration</u>: establishment of the first village-level political office
1970s CE	<ul style="list-style-type: none"> - <u>Administration</u>: complete restriction of access to Upper Mustang - <u>Migration</u>: Upper Mustang's outflow migration
1975 CE (UNDP, 2006)	<ul style="list-style-type: none"> - <u>Administration</u>: setting of regional boundaries and the establishment of the seven Village Development Committees 'VDCs' and District Development Committees 'DDCs' by King Birendra; nationwide introduction of the Small Farmer Development Programme 'SFDP'
1981-1990 CE (Pokharel et al., 2006)	<p><i>Main economy</i> <i>'Highland pattern' (decline)</i></p> <ul style="list-style-type: none"> - <u>Mountainous husbandry</u>: 10-50% decrease in Upper Mustang's cultivated fields; VDCs tax external herders for grazing on the locality's pasturelands on monthly or annual basis (i.e. tax free for nine nomadic families in Upper Mustang)

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<p>1983 CE (UNDP, 2006) (Pandey et al., 2005)</p>	<p>- <u>Political consolidation/administration + Environmental threat</u>: Tibetan herders cross-border grazing in Upper Mustang (i.e. overgrazing)</p>
	<p style="text-align: center;"><i>Main economy</i> <i>'Highland pattern' (partial rise)</i></p>
<p>1984 CE</p>	<p>- <u>Mountainous husbandry</u>: Upper Mustang's and other Western Nepali regions partial access to the Tibetan pastures upon the Five Years Livestock Agreement</p>
	<p style="text-align: center;"><i>Main economy</i> <i>'Highland pattern' (decline)</i></p>
<p>1985-1996 CE</p>	<p>- <u>Mountainous husbandry</u>: decrease in numbers of yak</p>
<p>1986 CE (UNDP, 2006) (Pandey et al., 2005)</p>	<p>- <u>Natural reserve</u>: declaration of Annapurna Conservation Area Project 'ACAP'</p>
	<p>- <u>Administration</u>: Upper Mustang is accessible to a limited annual number of 200 eco-cultural tourists upon payable USD 700 permit/visa for 10 days, escorted by a Liaison Officer</p>
<p>1992 CE (Heredge, 2003) (UNEP, 2008) (Duns, 2011)</p>	<p>- <u>Natural reserve</u>: Annapurna Conservation Area Project 'ACAP' compromises the western vicinity of Upper Mustang in 1992 CE; King Mahendra Trust for Nature Conservation 'KMTNC' acts on behalf of ACAP in Upper Mustang</p>
	<p style="text-align: center;"><i>Main economy</i> <i>'Low and Highland pattern'</i></p>
	<p>- <u>Transportation (decline)</u> - <u>Mountainous husbandry (decline)</u> - <u>Wage labor (constant at low profile)</u></p>
	<p style="text-align: center;"><i>Supportive economy</i> <i>'Highland pattern' (constant at low profile)</i></p>

	<ul style="list-style-type: none"> - <u>Eco-cultural tourism</u> - <u>Tourism accommodation facility</u>: same traditional tea houses, functioning for tourists instead of traders and pilgrims <p><i>Illegal economy (relatively considerable)</i></p> <ul style="list-style-type: none"> - <u>Smuggling</u>: Non-Timber Forest Products 'NTFPs'
<p>1993 CE (Heredge, 2003)</p>	<p><i>Main economy</i> <i>'Low and Highland patterns'</i></p> <ul style="list-style-type: none"> - <u>Mountainous husbandry</u>: Mustang's livestock inventory amounts to 11,825 sheep and 38,271 goats
<p>1998 CE (UNDP, 2006)</p>	<ul style="list-style-type: none"> - <u>NGO</u>: Himalaya Amichi Association for herbal medicine - <u>Administration</u>: Mustang District Development Committee; introduction of the Mustang Tourism Development Co-operative - <u>Distribution of subsidized goods</u>: staples
<p>2000 CE (Heredge, 2003)</p>	<p><i>Supportive economy</i> <i>'Highland pattern' (constant at low profile)</i></p> <ul style="list-style-type: none"> - <u>Eco-cultural tourism</u>: 800 tourists in 1992-200 CE
<p>July 2000-December 2006 CE (UNDP, 2006) (Pandey et al., 2005)</p>	<ul style="list-style-type: none"> - <u>Upper Mustang Biodiversity Conservation Project 'UNDP'</u> - <u>Population</u>: 5,395 individuals/1171 households (i.e. 2,730 males and 2,665 females) in Upper Mustang - <u>Transportation</u>: commencement on the construction of Tibet-Mustang-Nepal/Korolla-Jomsom asphalt road 'Korolla Pass'
<p>2001 CE (Boselli et al.) (UNDP, 2006) (Duns, 2011)</p>	
<p>2002 CE (Pokharel et al., 2006)</p>	<p><i>Main economy</i> <i>'Highland pattern'</i></p> <ul style="list-style-type: none"> - <u>Mountainous husbandry</u>: Upper

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2003-2006 CE
(UNDP, 2006) (Heredge, 2003)

Mustang's livestock inventory amounts to 36,503 animals; rangelands represent 55.65% of total area

- Administration: suspension of tourist escort regulation (i.e. Liaison Officer)
- Revenue: 60% of the tourists' permits/visas would be refundable for the development of Upper Mustang, based on the amendment of the National Parks and Wildlife Conservation Act of 1973, allowing 30-50% refundable local revenues (i.e. negotiations by UNDP and approval)

2004 CE
(UNDP, 2006)

- Political consolidation/administration: construction of the 34km long and 2.5m high Chinese Tibet-Upper Mustang border fence

2006 CE
(UNDP, 2006) (UNEP, 2008)

- Population: 5,412 individuals in Upper Mustang

- Administration: Upper Mustang is accessible to a limited annual number of 1,000 eco-cultural tourists under the same payable USD 700 permit/visa for 10 days

- Education: proposal for the establishment of a Buddhist University in Upper Mustang

- Electricity: 2 micro hydro-electrical units/2 communities/288 households/6-7 months annually 'April-October'

- Environmental threat: Global Warming; fuel wood consumption (i.e. 1.1 ton/individual/year)

- Housing: mud bricks

2008 CE
(UNEP, 2008)

Main economy
'Highland pattern'

- Mountainous husbandry: 70 hectares of agricultural land; introduction of apple farms nearby the southern boundary of Lower Mustang

- Transportation/trade: Chinese trucks with 30-40% reduced prices Vs out of the

	traditional costs to Upper Mustang
	<i>Supportive economy</i> <i>'Highland pattern' (constant at low profile)</i>
	- <u>Tourism accommodation facility</u> : 1,500 beds capacity/28 lodges and 31 camping sites
2011 CE (UNDP, 2006) (Duns, 2011)	- <u>Transportation</u> : Tibet-Mustang-Nepal/Korolla-Jomsom asphalt road 'Korolla Pass' approaches the outskirt Lo Manthang
2012 CE (UNDP, 2006)	- <u>Natural reserve</u> : King Mahendra Trust for Nature Conservation 'KMTNC' activities fulfillment

Although the Sinai Peninsula is thousands of years consolidated land under a central government in the Nile Valley—internationally recognized archeological-based evidence—(i.e. centralized control over fortifications/outposts, caravan routes, localities, taxes, legislation and subsidizes in ancient times, in addition to the provision of identification cards and conduction of censuses over the past 200+ years), vast remote and rigid stretches of pocket lands were and/or still subjected to constrained and/or no interest. The High Mountains of Sinai Peninsula—governance level—has been one of other similar pockets with little interest till late 1960s-early 1970s CE upon the rise of the eco-cultural mass tourism (i.e. market economy). It is a distinctive land; throughout history, its Bedouins are perceived differently by both the neighboring tribes and partially by the consecutive central governments in Cairo, but similarly subjected to the common perception of the sedentary agricultural societies (i.e. Nile Valley), although almost none of the Gebaliya Bedouins is currently a classical nomad,¹ while few nomadic Bedouin communities does exist in the entire Sinai Peninsula. Historically and relatively, the mountain range as a pocket land within a trans-border region—Sinai Peninsula—has been perceived as a terrain of neither socioeconomic nor socio-

¹ Currently, the perception holds due to the remoteness and partial isolation of the rural Bedouin communities, with limited Nile Valley population who mostly settle in the Sinaitic rural-urban/urban areas along the coasts (Shams, 2011e).

ecological potential for military infrastructure, due to its distant location relative to the historical and modern Sinaitic warfare frontier, but subjected to multilevel degrees of military means of control.

9.1.2 The question of environmental capacity between private and public ownership

Conflicts can arise in pastoral communities like Dolpo's "as well as Upper Mustang" because households are operating private enterprises that draw upon public resources such as pastures and water sources, which are collectively controlled....therefore, more complex forms of community labor and arrangements for common resources....*The Tragedy of the Commons, Garret Hardin*....Others will echo this behavior where formalized boundaries and tenure are absent, and thus communal lands are more likely to be degraded; as a corollary, *privatization*² would reserve these trends (Bauer, 2004).

However, while increased productivity should benefit wildlife the gains remain fragile since the increased productivity may in time simply result in an increased number of livestock....why poor local communities with few other income-generating options than keeping livestock would voluntarily refrain from maximizing their livestock numbers (UNDP, 2006).

Conceptually, *the Tragedy of the Commons* is subjected to Emanuel Marx's *Profit Maximization Theory*.³ On governance, business and

² Privatization is a negatively perceived term by common people in Arab Republic of Egypt due to its utilization as a tool of corruption and social polarization during Mubarak's regime, via the dilution of the state's tangible assets by concentrating it in the hands of inner political support circle; paradoxically, under the declared conception of public assets preservation and development (European Research Academy 'EURAC'/Institute for Alpine Environment 'AlpEnv', SinaiAlps Project 2011-2012).

³ In March 2013 CE, it is scientifically interesting to find Emanuel Marx 'Professor Emeritus of anthropology at Tel Aviv University', who did not miss the opportunity of the current transition phase in the Middle East '2011-2013 CE', compromising all his previous research themes, concepts and theories about the Bedouins of the Negev Desert and Sinai Peninsula in a new title in June 2013 CE: *'The Bedouin of Mount Sinai: An Anthropological Study of their Political Econom'*. This conceptual application of the themes, concepts and theories in practice is clear while comparing between Marx's previously published accounts and the table of contents of the new title. Marx's new title indicates Mount Sinai (i.e. the historical and economical center of the High

community levels in the High Mountains of Sinai Peninsula, *the Tragedy of the Commons vis-à-vis* Makhad Trust water dams issue–arid/semi-arid watershed management–and the medicinal plants collection process (i.e. Medicinal Plants Conservation Project ‘MPCP’ and Medicinal Plants Association ‘MPA’). On one hand, the mountainous orchards represent traditional land use (i.e. private ownership), but on the other hand, the Bedouin owners draw/pump water from a common public groundwater reservoir, based on the size of the orchard(s) and owner’s wealth. It is an unregulated consumption of water resources which has been consolidated for generations based on an extended practice of trial and error realization for the environmental capacity on seasonal basis. A part of the upper control limits of the actual environmental capacity, it is the same case for the farmsteads of Alto Adige/South Tyrol ‘Alps’ and Upper Mustang ‘Himalaya’ with a major exception: the Alpine and Himalayan farmsteads receive direct precipitation rates (i.e. rainfall and snow), decreasing the pressure on common water resources with exception to the summer season.⁴ Additionally, privatization of forest and pasture lands has been adopted in Alto Adige/South Tyrol ‘Alps’ as a feasible solution for hundreds of years, contributing to the relative preservation of natural resources. Contrarily, pasture lands, and wood shrubs or forests has been always communally regulated on village or tribal levels in the High Mountains and Sinai Peninsula and Upper Mustang, subjecting any rise in the natural resources to profit maximization, and consequently to degradation. Obviously, it depends on the markets and economic feasibility at the time of a specific transition phase. For example, the low productive pastures of the High Mountains of Sinai Peninsula are currently under limited grazing pressures compared to the rising medicinal plants collection. The attempts of the Medicinal Plants Association ‘MPA’ to privatize the collection zones on

Mountains of Sinai Peninsula) as a potential case-study which reflects the current transition in similar societies (Marx, 2013).

⁴ The Global Warming ‘Climate Change’–whether due to anthropogenic or cyclic causes–is increasing the pressures on water resources during the summer, represented in the retreating glaciers which provides less water, leading to the tapping of groundwater–environmental alert–in the inner Alps arid zones (e.g. Val Venosta-Vinschgau) (European Research Academy ‘EURAC’/Institute for Alpine Environment ‘AlpEnv’, SinaiAlps Project 2011-2012).

clan/household land use basis was refused by all the Gebaliya Bedouin elders in favor of a regulated collection process for the entire community. Accordingly, it is always feasible to start on the solid ground of traditional land use as long as the resource of market interest is a traditionally consumed one. The core pitfall of St. Catherine Natural Protectorate is the lack of dynamic monitoring indicators for the carrying capacity, concurrently with considerable exceptional success regarding the medicinal plants collection and production–Medicinal Plants Association ‘MPA’–and with almost no feasible attempts with arid/semi-arid watershed management. Any future resource management plan must utilize a package of feasible socioeconomic and socio-ecological instruments and incentives, not just direct restrictions.

9.1.3 The question of governance, local revenue, and polarization of eco-cultural tourism

(Since 1992 CE, Upper Mustang as well as the neighboring Dolpo in 1980s-1990s CE)...These forces of transformation included tourism, biodiversity conservation and development initiatives....A major problem with these integrated conservation and development projects has been that they tend to underestimate the costs of compensating people losses (Bauer, 2004).

Already frustrated by a decade being exploited “Upper Mustang in 2003 CE” and in seeing no benefit in tourism, local people will have little incentive to conserve the very assets that attract tourists....Lack of success in implementing projects is likely to have generated disillusion with the effectiveness of the participation process. Trust will need to be rebuilt and given the constraints imposed by the government, this will be difficult (Heredge, 2003).

Exactly the same inter-impacting forces of transformation imply to the High Mountains of Sinai Peninsula under Western incentives, as well as in South Tyrol ‘Alps’ with a lag in the sustainable development status. Such a lag is mainly caused by the absence of a strategic vision due to the political instability, reflected in the frequency of economical transition phases and screened by the socioeconomic timelines. Nevertheless, the mountain range is socioeconomically and socio-ecologically viable compared to other mountain geographical pockets, as a result of Mount Sinai eco-cultural tourism market. The costs of compensating people losses are equivalent to the previously mentioned

matter of instruments and incentives. On June 14, 2012-early 2013 CE, the frustration in the Arab Republic of Egypt is a nationwide fact after the increasing doubts about a critical change which might take place post the Egyptian National Reforms Revolution of January 25, 2011 CE.⁵

Actually, the Arab Republic of Egypt will debate over the ideology for a quite a long time—if no surprising decisive decision will be enforced on the political scene⁶—until a sort of balance will be reached, then real production will surface at some point of relative stability, under the Culture and Ideology—religious/political—which has been there for ages. In Egyptian reality, power will prevail, and it will be the time of the real choice; literally, due to the lack of the very basic Social Capital within the Egyptian community for ages: Production-oriented Trust.

The Nepali state has tended to view rangelands as national resources, subject to government-level decisions, planning, and development. Yet the center did not necessarily control the local dynamics of rangeland use and tenure (Bauer, 2004).

Since 1962 with the development of the Panchayat system in Nepal, there has been a structure for community participation in planning. This system was developed to set up a partyless democracy, decentralizing and transferring power to people directly, "taking institutions to the people" to enable mass participation. It was popularized in the "Go to the Village" campaign, with local Panchayats made responsible for local development. Village Assemblies would formulate plans, with each citizen able to submit their ideas. ACAP has gone a long way in working with local people in Mustang, but weakness in the Village Assemblies means that local people's influence is severely restricted. Panchayats need to be strengthened and given legal powers, rights, duties and funds. They are

⁵ On May 21, 2012 CE, the first round of the presidential elections officially came out with a second round between an ex-militant and a Political Islamist (i.e. Muslim Brotherhood), compromising the political scene between the same two centers of power prior the revolution, followed by argumentative juridical decisions about the overthrown president Hosni Mubarak and his assistants on June 2, 2012 CE, in addition to another argumentative constitutional juridical decision on June 20, 2012 CE—legitimacy issue—about the dilution of the parliament which was dominated by the Political Islamists. Nevertheless, the degree of political progress is under a nationwide debate!

⁶ Currently taking place on the political scene in June 2012-early 2013 CE.

not given any positive supervision or guidance from the centre and often interest groups are able to block implementation of plans. Empowerment only occurs when the government is prepared to act on the voice of local communities (Heredge, 2003).

The decentralized governance aspect must be founded on solid pillars, mainly in terms of legal powers (i.e. multilevel regulations) and funds, balancing between customization on the micro-local/municipality level and standardization on the macro-regional/governorate one. In case of the blockage of the proposed neo municipal governance structure—organizational blueprint—(i.e. phase I, semi-decentralization '5-10 years': education and socioeconomic leverage; phase II, full democratization '10-20 years': micro-local financial resources decentralization) due to the political instability status, a governmental institution must take the lead, being identified by the prioritization of the micro-local/municipal socioeconomic and socio-ecological needs. St. Catherine Natural Protectorate is established to play such a leading key role, currently requiring considerable reforms on managerial, disciplinary and financial basis.

Although the National Parks and Wildlife Conservation Act 1973 was amended to allow 30-50% of locally generated revenues to be retained by for development, this was never effectively implemented in practice (Heredge, 2003).

Key successes....agreement with the government for ploughing back 60% of tourist entry fees for conservation and social development (UNDP, 2006).⁷

⁷ Legal instrument: a similar amendment to the Egyptian Law No. 102 of 1983 on the Natural Protectorates is required in order to secure independent financial resources (Official Gazette, 1983a).

"Article titled: *Mapping the use of natural reserves in various fields*; Declared Ahmed Abdeen 'Minister of Local Development', it is decided to prepare land use maps for natural reserves in the fields of tourism, agriculture and various industrial which rates in line with the natural reserves, creating an optimal system, taking into account the equitable sharing of the reserves' revenue, for the benefit of Egyptian society in general and the local population as a direct return....In turn, Mustafa Kamel 'Minister of State for Environmental Affairs'....explained that the investment opportunities in the natural reserves is divided into three key sectors: first, projects presented in global outbidding; second, projects require capital and expertise, and exposure in Egyptian and Arab outbidding; third, small projects require local expertise and exposure

Obviously, it is the most crucial sustainable development instrument of all in order to finance the proposed neo municipal governance structure, or St. Catherine Natural Protectorate as a vital integral or independent key institution in the High Mountains of Sinai Peninsula. There are two core previously planned and newly introduced financial resources respectively:

- 1 admission fees
- 2 refundable tourism companies' taxes and/or fees

Both must be on the agenda of any negotiations with the central government in Cairo once a degree of political stability is achieved nationwide.

Tourism does offer employment opportunities, but often not many jobs go to local people, and benefits go mainly to hoteliers, travel and trekking agencies and airlines (Heredge, 2003)

The division between rich and poor households is increasing due to tourism (Oral communication)....It is a benefit for them (lodge owners) but since we do not have any capital to be able to invest it does not give us profit (Oral communication)....At an overall, the positive aspects of tourism offset the negative aspects for most households in Kagbeni (Duns, 2011)

Mount Sinai eco-cultural tourism management is a considerable success story in Sinai Peninsula. The Gebaliya tribe guides and cameleers household-based circulation system secures a minimum revenue share per household in the mass tourism revenue. The system achieved less success with the remote valleys and mountainous areas, but still viable and economically feasible. Nevertheless, the Gebaliya Bedouins debate over hoteliers, travel and trekking agencies and airlines for receiving most of the revenues. Practically, the unavoidable source of eco-cultural tourism polarization in the High Mountains of Sinai Peninsula is limited to the Bedouin camps and ecolodge owners. This fact could be feasibly marginalized via compensating the local community by the 30-50% reinvestment of taxes and fees. It would also compensate the inhabitants of the southern half of the mountain range—Awlad S'aed tribe—who shares the Gebaliya tribe some areas in

directly to local communities in coordination with the governorates." (El Shrouk Newspaper, December 13, 2012).

the northern half but has no access to the revenues of eco-cultural tourism.⁸ Since 1970s CE, the eco-cultural tourism allowed several potential inter-impacting opportunities:

- 1 establishment of hotels, lodges and shops
- 2 wage labor for guides and cameleers
- 3 local products' market accessibility
- 4 catalyst for the urbanization and modernization processes
- 5 wide scale involvement in the for-profit and nonprofit sectors (Duns, 2011)

9.1.4 The question of homogenous subdivided community

However, the opportunities in livelihood strategies differ between indigenous and non-indigenous households "*Not a Sinai Issue*". The latter group mainly originated from neighboring districts or the Tibet Autonomous State, has fewer opportunities and seems to be more vulnerable in certain aspects than indigenous households....As a consequence, it is shown that non-indigenous households do not, or into a lesser extent, benefit from tourism since they are hardly able to own lodges or tourism affiliated business (Duns, 2011).

Historically in scientific bibliography and on daily life basis, the homogeneity of the Egyptian community is not subjected to a highly questionable argument due to the fact of the dominating Islamic religion and Arab ethnicity, as all other religious and/or ethnic minorities share the same Arabic culture and language, besides the locally used ones in the inner circles. Consequently, a part of the previously discussed perception of the sedentary agricultural societies, the homogeneity of the Sinaitic Bedouin society in relation with the Nile Valley citizens is a question of decentralized governance and local community empowerment, acting as viable approaches to the potential merge of both sub-divisions, caused exclusively by the remoteness factor. Currently on June 15, 2012-early 2013 CE, post the Egyptian National Reforms Revolution of January 25, 2011 CE and one day prior the second round of the presidential elections, in addition to the lag in

⁸ The issue of Awlad S'aed tribe shares in eco-cultural tourism revenues is subject to a traditional tribal rights' argument with the Gebaliya tribe (Shams, 2011e).

development activities, the homogeneity of the social structure in the Arab Republic of Egypt—historically classified as a core division homogenously co-existing with other sub-divisions—is subjected to a critical test upon participating in an argumentative process towards democracy; the state is on the brink of a split and shift towards a behavioral social heterogeneity which might extend to the homogeneity of the social structure, otherwise. The socioeconomic and socio-ecological capacity of the High Mountains of Sinai Peninsula would not support inflow migration, concurrently with the potential socioeconomic and socio-ecological challenges facing the natural growth rate of the local Bedouin community. On the Sinaitic level, the proposed future inflow Nile Valley migration must take into account the traditional land use patterns while introducing new ones, whether by taxes and fees reinvestment, and/or direct employment opportunities and land ownership for all the homogeneous sub-divisions of the Egyptian society.

9.1.5 The question of indigenous knowledge

Indigenous knowledge encompasses practical skills and time-tested methodologies for using and managing natural materials (Bauer, 2004).

There is often a revival in interest in traditional languages “*Arabic dialect in the Sinaitic case*” and culture by local people when they recognize the respect that visitors have for them (Heredge, 2003).

Sinai Development Study ‘SDS’ considered many alternative strategic approaches to the full development of Sinai....alternative concepts designed and evaluated in some depth included....a stronger influence of “past trends” on the future (Dames & Moore, 1979-1985).

Indigenouness does not imply to Sinai Peninsula. Actually, the time-tested knowledge (i.e. local traditional cultural, not political and legal aspects) is highly regarded in theory and practice in case-studies such as the Medicinal Plants Conservation Project ‘MPCP’ and Medicinal Plants Association ‘MPA’, and St. Catherine Natural Protectorate out of action zoning plan, while being less regarded in case-studies such as the Makhad Trust water dams issue, although the trustee highly regards the local traditional knowledge in other practices.

9.1.6 The question of accessibility impact

Before the road construction our youth knew Tibetan songs and the monks did not listen western music (Duns, 2011).

Asphalt roads' construction is usually perceived by locals and general public as a sign of development. In nature reserves and UNESCO World Heritage Sites 'WHS', similar roads are always under the pros and cons of the socioeconomic and socio-ecological needs-based prioritization debate:

- 1 30-40% prices decline in household commodities (i.e. transportation costs deduction)
- 2 local products' market accessibility (e.g. Tarns-Himalaya and Sub-Himalaya markets)
- 3 energy alternatives (i.e. gas and kerosene replace wood and dung);
- 4 motor transportation availability
- 5 increase in solid waste
- 6 dust and noise pollution
- 7 remote mountainous areas outflow migration towards the axis valley and decline of smaller villages along the axis valley
- 8 decline in the traditional means of transportation
- 9 decline in the organic/bio means of agricultural production
- 10 tourists demands substitute effect (i.e. Mustang is long perceived as the remote *Forbidden Kingdom*) (Duns, 2011)

In addition to the social-cultural and landscape values (UNDP, 2006) in late 1980s-early 1990s CE, a similar debate was raised in the High Mountains of Sinai Peninsula between the authorities on one hand, and the Gebaliya Bedouins and the Greek Orthodox monks of the Holy Monastery of St. Catherine on the other hand about the introduction of Cable Cars in Mount Sinai vicinity (Hobbs, 1995); similarly, an asphalt road along W. Hibran which drains from the northwestern vicinity of the mountain range has been the everlasting resurfacing project of almost all the governors of South Sinai!

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